Industrial Ethernet Integration for Delta – Case Studies

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MYNAH℠

Introduction

- Why consider Industrial Ethernet integration
- DeltaV Industrial Ethernet integration
- Industrial Ethernet Protocols
- Case Studies
  - Rockwell PLC Integration
  - ESD Integration – Triconex, Triplex, HIMA
  - Remote Automation Solutions S600 Flow Computer
  - CSI4500 Machinery Health Monitor
  - Other Industrial Ethernet Devices

Business Case for Industrial Ethernet

- Integration of 3rd Party Devices
  - Can be “black hole” of time and money
  - Many legacy methods outdated and unreliable
- Why Industrial Ethernet for device integration
  - Easy to wire, COTS technology
  - Fast and Efficient
  - Flexible integration and user access
  - Deterministic by bandwidth and switched networks
  - Easy setup with the Virtual IO Module Network Gateway
- Protocol which protocol?
  - Modbus TCP/IP - 26%
  - Ethernet/IP - 25%
  - Profinet - 2%
  - Foundation Fieldbus HSE – 2%

ARC Industrial Ethernet Study 2004

Industrial Ethernet Protocols

The Net Gazette™

An ODVA Publication for Its Members ★★★April 2007 ★★ www.odva.org

NEWS AND NOTES

SCHNEIDER ELECTRIC BECOMES A PRINCIPAL MEMBER OF ODVA

USE YOUR MEMBERSHIP!

DATES FOR 2007 NORTH AMERICAN TOUR OF "ETHERNET/IP: THE PROVEN & COMPLETE SOLUTION FOR MANUFACTURING AUTOMATION" ANNOUNCED

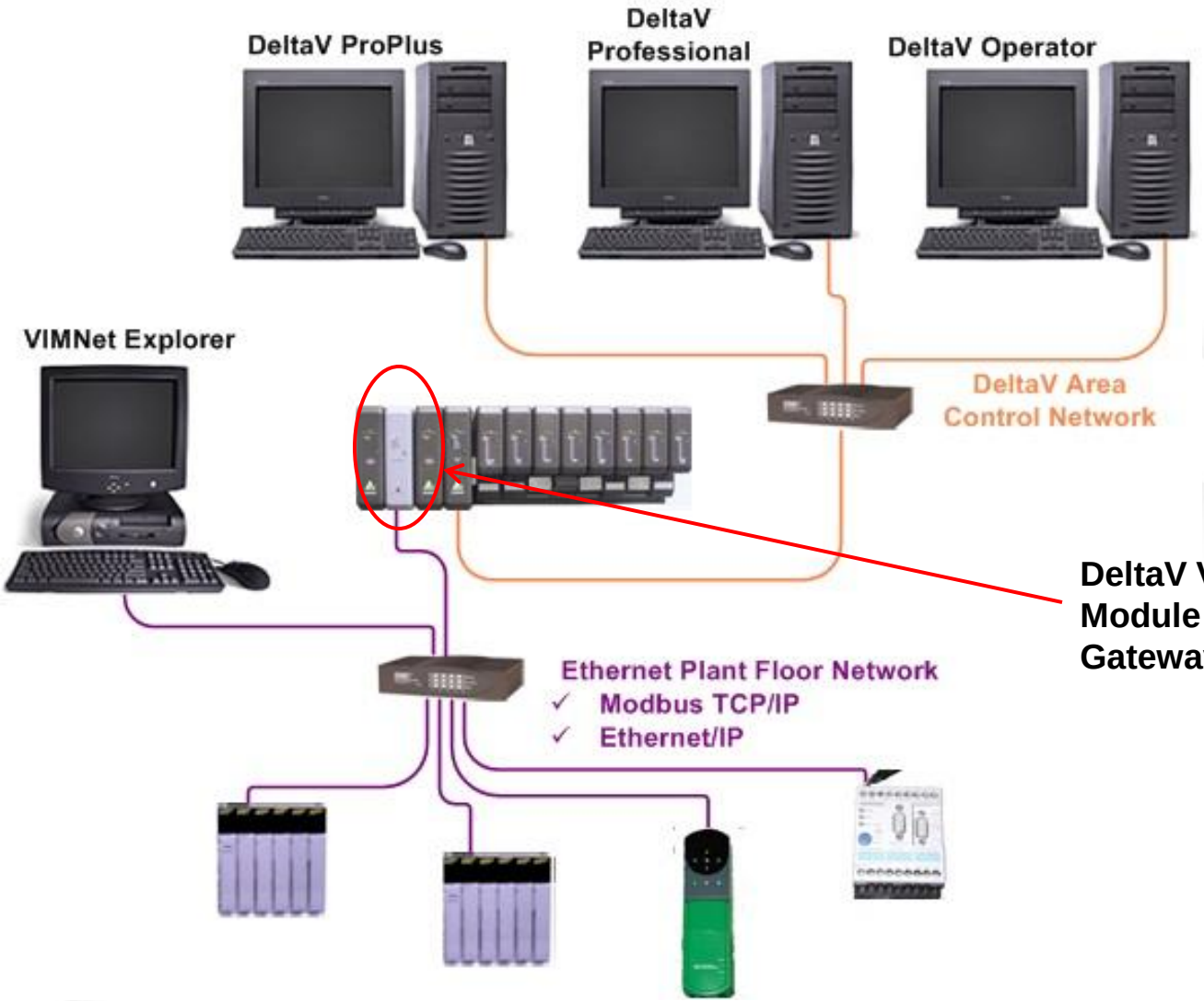
TRAINING AND WORKSHOPS

EtherNet/IP Implementor Workshops: North American Tour

SCHNEIDER ELECTRIC BECOMES A PRINCIPAL MEMBER OF ODVA

ODVA today announced that Schneider Electric, S.A., a worldwide leader in power and control and a member of ODVA, will significantly increase its level of support for the organization by becoming one of its principal members, alongside Cisco Systems, Eaton Electrical, Omron Corporation, and Rockwell Automation. Schneider Electric's increased participation in ODVA coincides with ODVA's plans to extend the CIP Network specifications to provide compatibility of Modbus®/TCP devices with networks built on the Common Industrial Protocol (CIP™). This extension will give existing Modbus/TCP users a clear path to CIP Network architectures while protecting their automation investments.

DeltaV Industrial Ethernet Integration

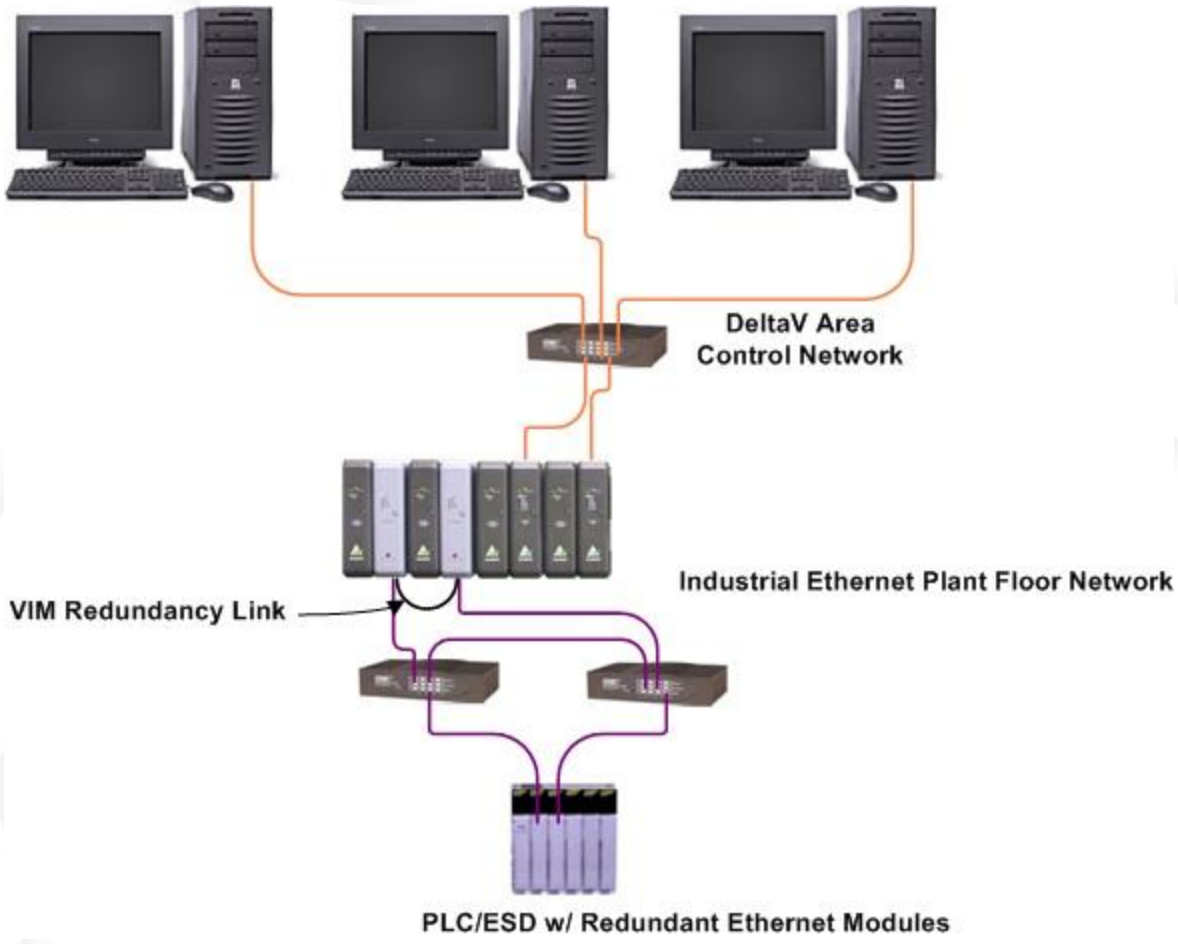


DeltaV Industrial Ethernet Integration

- VIM-4201, DeltaV Virtual IO Module Network Gateway
  - Direct DeltaV IO Interface – emulates DeltaV Serial Cards in IO slots 57-60 or 61-64 (128 Datasets)
  - Supports 128 Datasets (100 Registers/Dataset) over 32 TCP/IP Addresses and 128 Modbus Addresses
  - IO Configuration in Serial Card Registers
  - Network and Module Setup in VIMNet Utility (ships with the Driver Pack)
  - Uses DeltaV Power Supply, Carrier
  - RJ45 Network Connection, RJ11 Redundancy Link

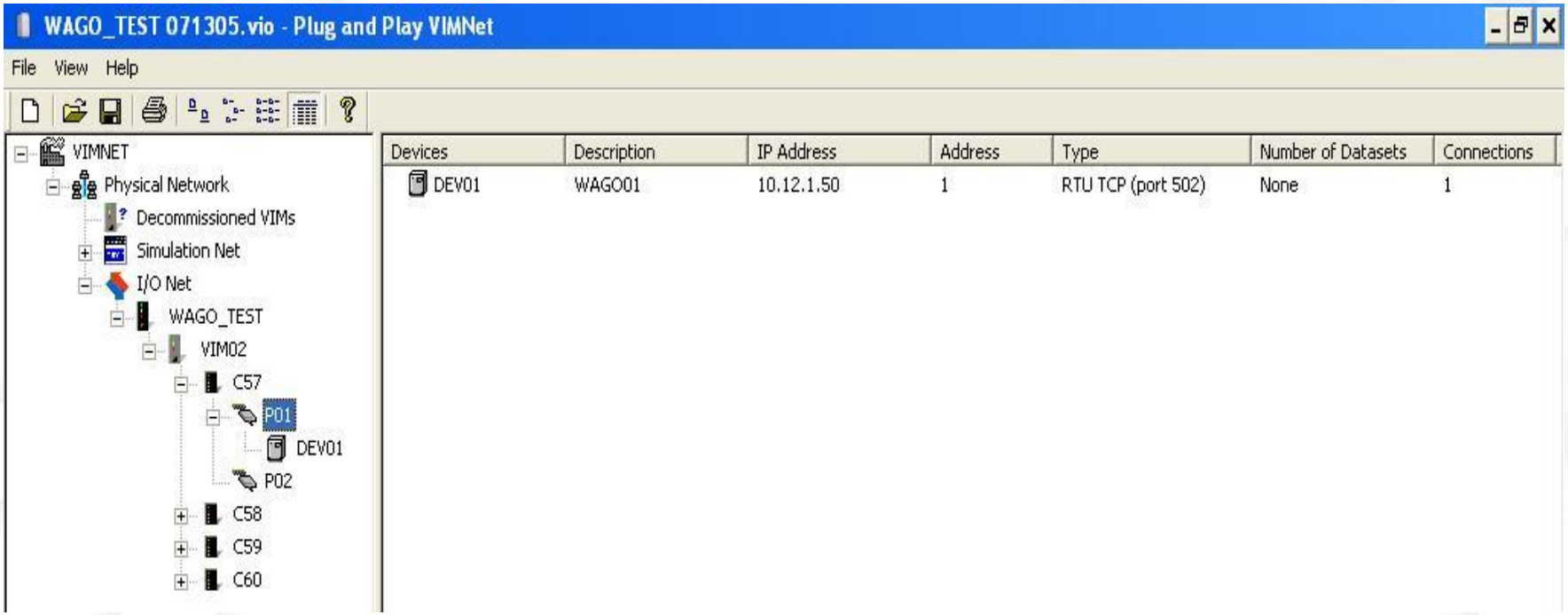
DeltaV Industrial Ethernet Integration

Ethernet Integration Redundancy Architecture



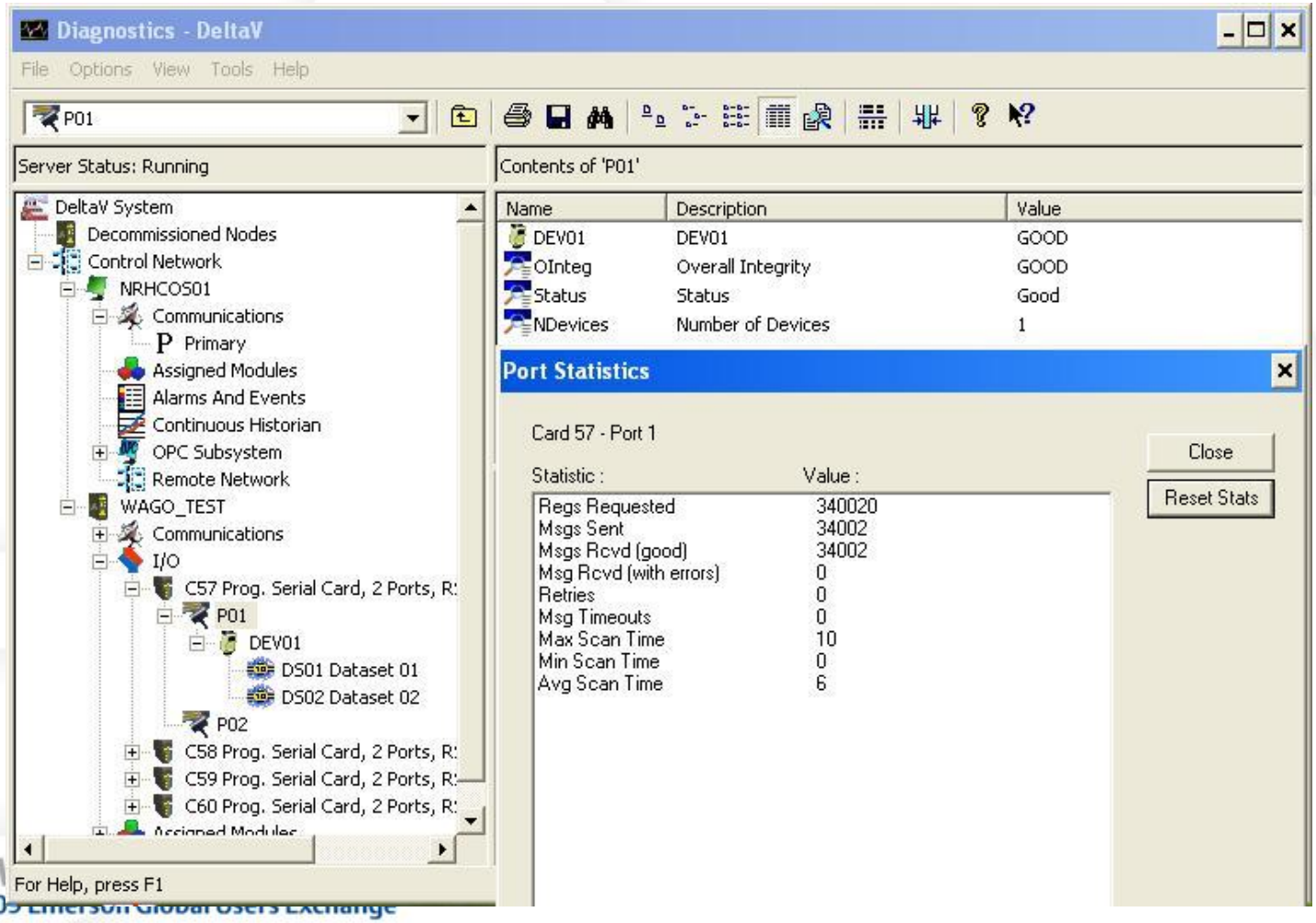
DeltaV Industrial Ethernet Integration

- VIMNet Explorer Utility
  - Define PLC Network Configuration to DeltaV
  - Commission VIMs, Define Network Node IP and Address
  - Runs on DeltaV ProPlus or other workstation



DeltaV Industrial Ethernet Integration

- Configure Data in DeltaV as Serial Card Datasets
  - Modbus or A-B DF1 Data Definitions



DeltaV Industrial Ethernet Integration

Comparison to Other Integration Methods

	Serial Interface	Industrial Ethernet	OPC Server
Network Protocols	**Modbus, DF1**	**Modbus TCP/IP, Ethernet/IP**	**Varies**
Capacity per Unit	**3200 Registers (100 Reg x 32 DataSet)**	**12,800 Registers (100 Reg x 128 Datasets)**	**30,000 Parameters**
Network Speed	**19.2 Kbaud Typical, 115 Kbaud Max**	**10 Mbaud**	**Varies, 100 Mbaud Max**
Data Throughput	**1000 ms / DataSet**	**100 ms for 16 DataSet**	**5000 parameters / sec**
Stability	**High**	**Medium - High**	**Medium - Low**
Redundancy	**Yes**	**Yes**	**Possible**
Ease-of-Use	**High**	**High**	**Low**
Cost	**1X**	**2 - 3X**	**4X Plus**

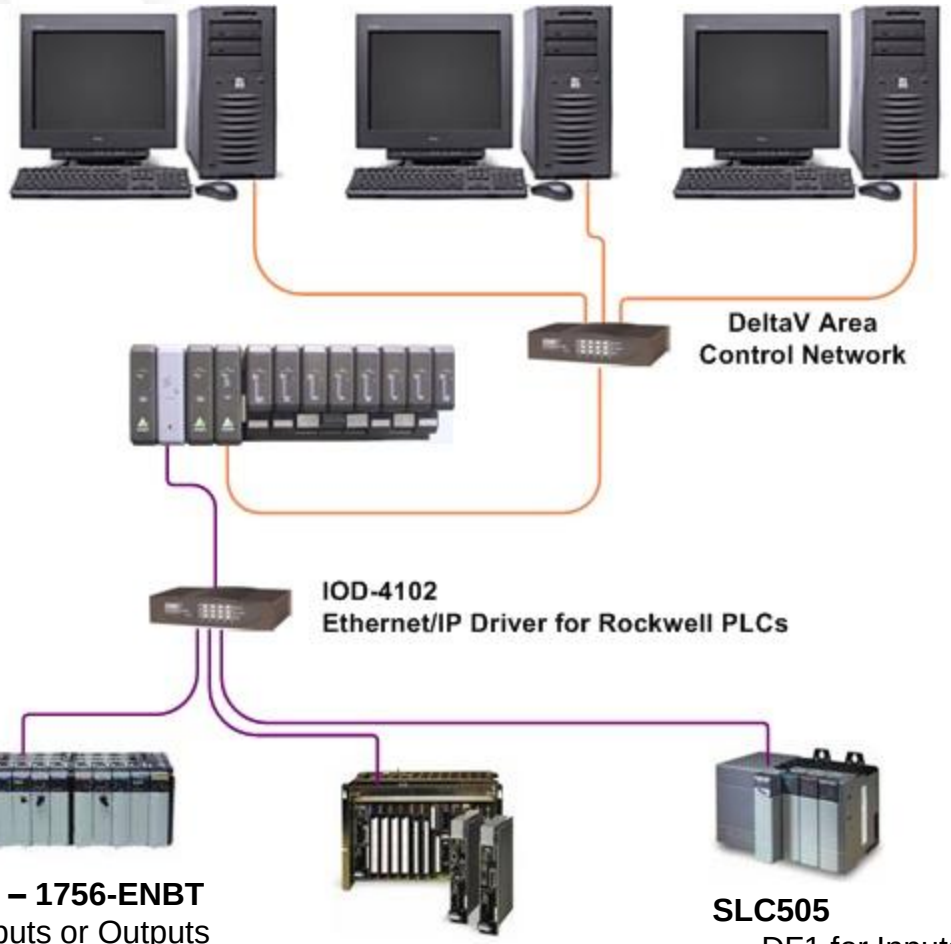
Industrial Ethernet Protocols

- Open Modbus TCP/IP Standard
  - Open, widely accepted data communication standard
  - RTU TCP – 6-byte header as defined by Modbus.org in TCP/IP packet, supported by most current devices
  - RTU via TCP – Modbus encapsulated in TCP/IP packet, supported by older devices
  - RTU UDP – broadcast message version, few devices
  - Bridging devices – Modbus Ethernet to Serial or ModbusPlus
  - Master/Slave and multiple master support
- Modbus TCP/IP Data Types
  - Boolean Inputs and Outputs
  - 16-bit Integers
  - 32-bit Integers
  - Floating Point Data (byte order selection)

Industrial Ethernet Protocols

- Ethernet/IP Protocol
  - UCCM (unconnected) Class 3
    - ✓ Encapsulated DF1 messages in Ethernet/IP packets
    - ✓ PLC5, SLC, and Logix Products
    - ✓ PLC5, SLC read/write to native tables directly
  - Class 1 IO (Producer/Consumer)
    - ✓ Supported by Logix PLCs and some 3rd party devices
    - ✓ Each Generic Module is one CIP Slot
- Ethernet/IP Data Types
  - Boolean Inputs and Outputs
  - 16-bit Integers
  - 32-bit Integers
  - Floating Point Data (byte order selection)

Case – Rockwell PLC Integration



ControlLogix – 1756-ENBT
- DF1 for Inputs or Outputs
- Class 1 for Inputs

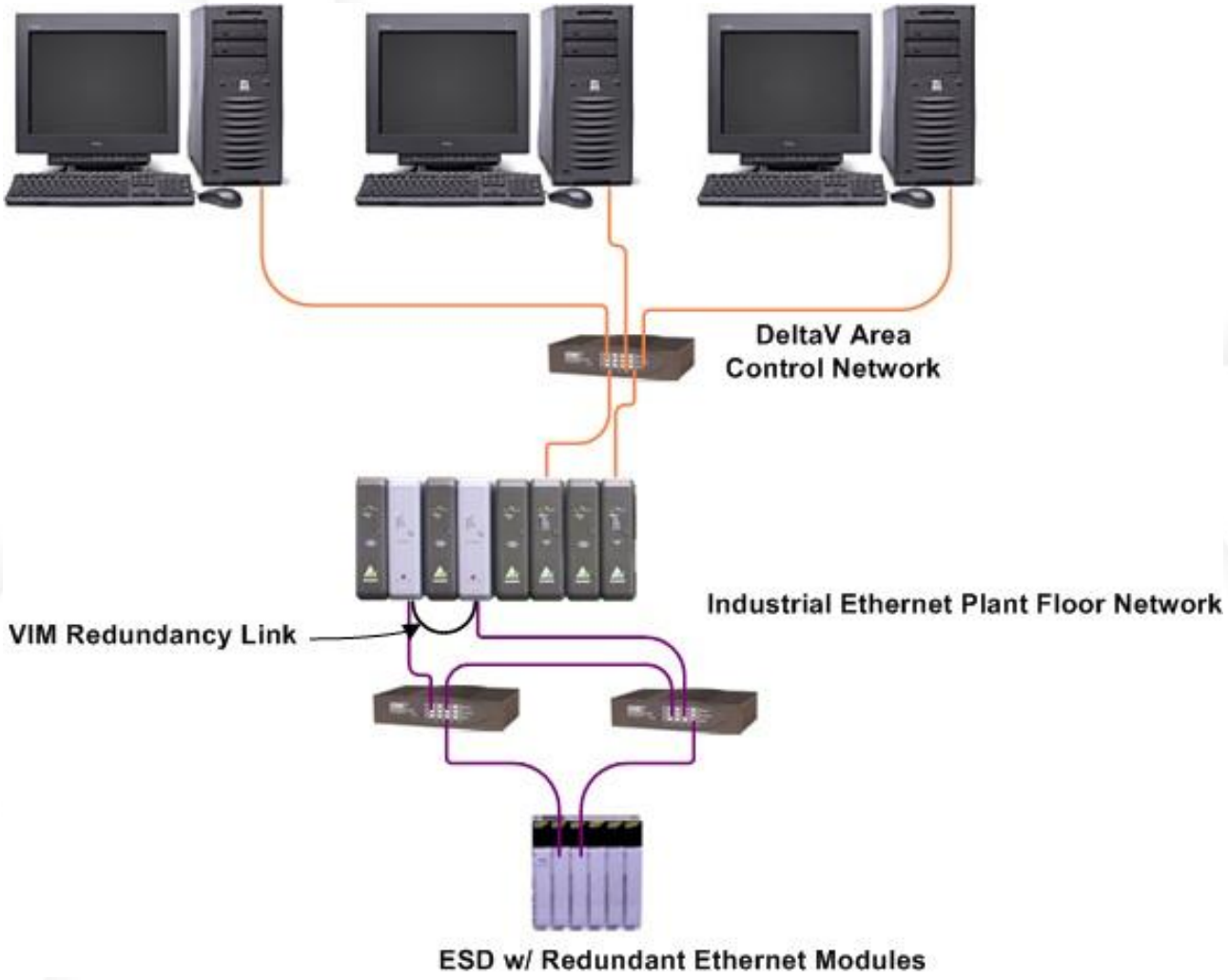
PLC5E or 1785-ENET
- DF1 for Inputs or Outputs

SLC505
- DF1 for Inputs or Outputs

Case – Rockwell PLC Integration

- Flexlogix, Compactlogix – same as ControlLogix in most cases
- Serial PLCs – SLC504, Micrologix – use 1761-NET-ENI Ethernet/IP to DF1 Bridge
- Hot Standby Logix – redundant system with specific requirements
  - Supports DF1 messages only
  - Select Switching IP for redundancy type
- Simultaneous Messages varies by PLC
  - ControlLogix – 16
  - PLC5 - 4
  - CompactLogix - 1

Case – ESD Integration

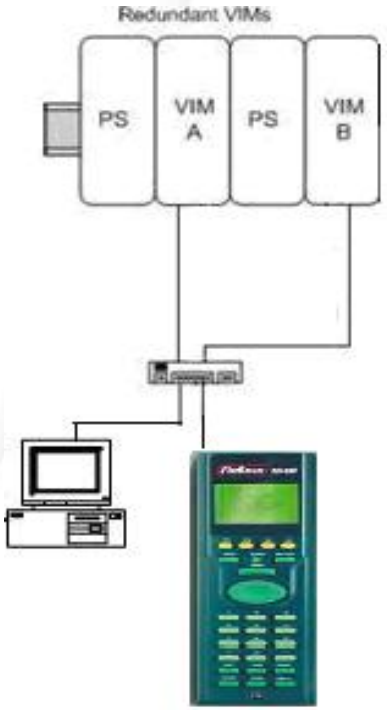


Case – ESD Integration

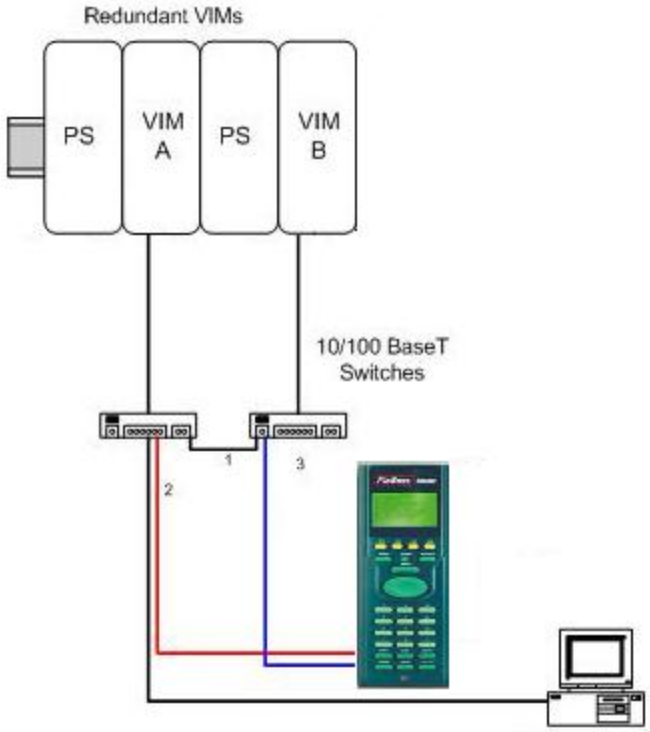
- Triconex Triplex ESD
  - TCM Module
  - Device should be set for Redundancy with No Switching IP
  - Simultaneous Messages 1
- HIMA H41q/51q
  - Ethernet Communication Module F8627X
  - Device should be set for Redundancy with No Switching IP
  - Simultaneous Messages 1
- Triplex Trusted T8110B TMR ESD
  - T8151B Trusted Communications Interface
  - RTU TCP supported in port 502, any other port RTU via TCP

Case – FlowBoss S600 Integration

Simplex Networks



Redundant Networks

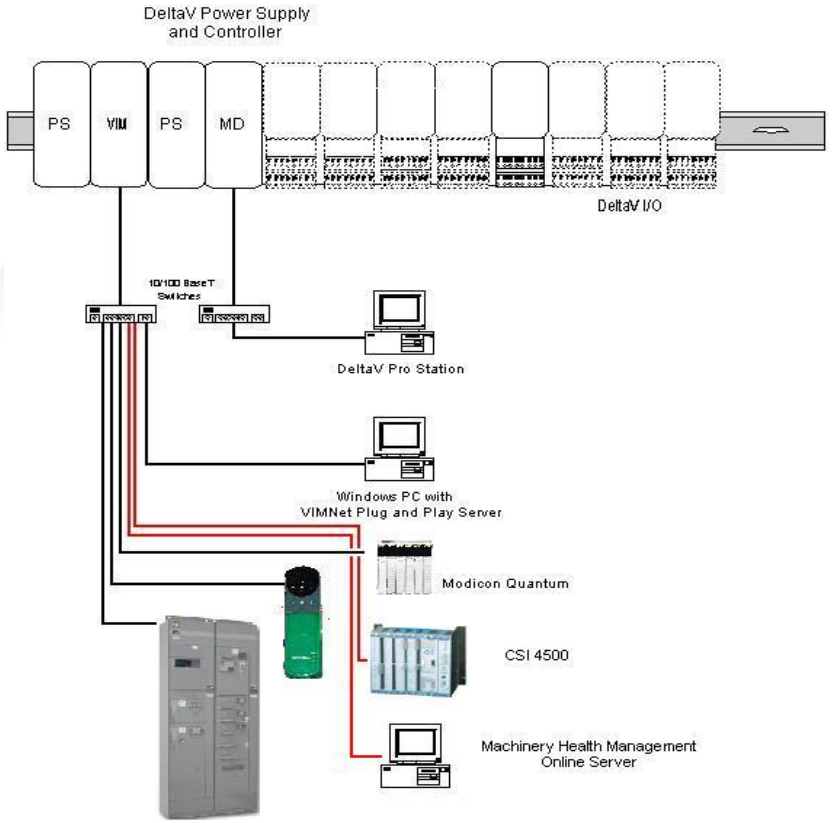


Case – FlowBoss S600 Integration

- Port Connections to S600
  - S600 only supports one connected device, both VIMs must talk to the port for redundancy
  - VIM uses ICMP Ping instead of standard Ping
  - First Input Dataset set with Device Data Type 20, Special Data Register 5 set to 2
- Redundant Network Setup Limitations
  - Primary and Secondary S600 NICs must be different networks
  - Device set to Redundancy with No IP Switching
  - Consecutive networks with subnet mask of 255.255.0.0
  - VIM A port 501, VIM B port 502

Case – CSI 4500 Machinery Health

- IOD-4101, Modbus TCP/IP Driver
- Modbus Map of AC/DC Values, Alarm Status, Value Quality, Time Stamps



Case – Other Device Integration

- IOD-4104, Generic Ethernet/IP Driver
  - Uses CIP Electronic Data Sheets and VIM Device Profiles
  - Mettler Toledo Q.Impact and JagExtreme, K-Tron Weigh Feeders, Panelview, FlexIO, Other stand-alone Ethernet/IP Devices
- IOD-4101, Modbus TCP/IP Driver
  - Rosemount 3240 Foundation Fieldbus Mux
  - Rosemount 1420 Wireless Bridge
  - MYNAH PLC IO Interface
  - GE 9030 PLC w/ IC693CMM321 module
  - Siemens S7/300 with CP343-1 or S7/400 with CP443-1
  - Siemens S505 with the CTI 2572-A module
  - Quantum Concept and Unity Revision PLC's
  - Red Lion Displays, Wago IO, Phoenix Contact IO, MT Mass Spec …

Summary

- Industrial Ethernet is a proven integration solution
- Industrial Ethernet provides excellent performance and stability
- Emerson engineering centers and local business partners have experience delivering Industrial Ethernet integration solutions
- …
- Questions?

Where To Get More Information

- MYNAH Website – www.mynah.com
  - IOD-4101 Quick Start Guide and User Manual
  - IOD-4102 Quick Start Guide and User Manual
  - Integrating Rockwell PLCs with DeltaV White Paper
  - Optimizing Industrial Ethernet Communication Tech Note
  - Industrial Ethernet Integration Application Notes
  - Industrial Ethernet Integration for DeltaV Pre-Recorded E-Seminar
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