Update on ODVA’s Initiative for the Process Industries

Optimization of Process Integration

Marketing Track

www.odva.org
Agenda

- Introduction to ODVA’s Process Initiative
- Environmental Assessment
- ODVA’s Approach to the **Optimization of Process Integration**
- Strategies for automation applications in the process industries from market leaders and ODVA principal members
- Next Steps
- Discussion
Introduction to the Process Initiative

Strategic Plan in Use by Board of Directors

Living Initiatives are a Central Aspect

- 2010: Energy
- 2011: Machinery
- 2012: Process

With leading industrial automation suppliers, such as Endress+Hauser, as principal members, ODVA will be one of the first associations which strives to support Industrial Ethernet down to the field level in process automation.

ODVA technologies will provide manufacturers complete, plant-wide network services and infrastructure for discrete, motion, safety and process applications and from plant-floor to IT systems.
Introduction to the Process Initiative

SMRt Participants in the 16th Term

- Mirko Brcic
  Endress+Hauser
- Shannon Foos
  Rockwell Automation
- Michel Fontvieille
  Schneider Electric
- Martyn Jones
  Schneider Electric
- René Pluis
  Cisco Systems
- Olivier Wolff
  Endress+Hauser
- Sandra Wesner
  Endress+Hauser
- Katherine Voss
  ODVA

Next Steps at ODVA

With support from Endress+Hauser along with fellow principal members

- Cisco Systems
- Rockwell Automation
- Schneider Electric

ODVA will be defining the strategic market requirements for an EtherNet/IP-based process strategy.

Technical work will follow.
Introduction to the Process Initiative

White paper published in February 2014 completed ODVA’s series of “optimization” white papers resulting from the formation of ODVA’s initiatives.

3. Optimization of Process Integration (OPI)
White paper published in February 2014 completed ODVA’s series of “optimization” white papers resulting from the formation of ODVA’s initiatives.

1. Optimization of Energy Usage (OEU)

2. Optimization of Machine Integration (OMI)

3. Optimization of Process Integration (OPI)
Environmental Assessment

Market Conditions for EtherNet/IP™...

... has been accepted and widely adopted in discrete applications.

...has helped to converge control solutions for discrete and hybrid applications.

... creates, by virtue of its adoption in hybrid applications, a critical proof point for adoption in additional process applications.

...makes it possible to replace multi-tier network architecture with a single architecture and provide easy access to process information.
Environmental Assessment

Technology conditions for EtherNet/IP and IP in manufacturing...

...an automation platform for convergence

Discrete ▶▶▶ ▶▶▶ Hybrid ▶▶▶ ▶▶▶ Process

Objects and services in CIP will create new opportunities for productivity improvements and ROI for process users.
Environmental Assessment

It is projected that the process industries will invest over US$100 billion globally in new control systems for process automation, split equally between modernization and new installations.¹

Environmental Assessment

▶ With some people forecasting the “Internet of Things” (IoT) to grow at a rate of 36% between now and 2021\(^2\), more and more devices will be IP-enabled by default.

▶ The overall impact of IoT can already be seen today in the process industries where the number of Ethernet-enabled devices has been forecast to double by 2016 with a compound annual growth rate of over 15%\(^3\).

▶ This trend is also consistent with thought leadership on key standards and technologies for future process automation systems in which the basis of plant level communication is expected to be industrial Ethernet\(^4\).

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\(^3\) T Moore (2013. 15 February) “Industrial Ethernet and Fieldbus Technologies – World – 2013”

ODVA’s Approach to OPI

ODVA has a broad overall approach to OPI based on the three principle domains of the industrial ecosystem – production, enterprise and power grid.
ODVA’s Approach to OPI

- **Convergent** in its long term approach to support the deployment of standard Ethernet and Internet technologies in the process industries across all domains of the industrial ecosystem.

- **Compatible** by enabling users to integrate new devices and systems with their installed base while evolving their automation architecture to complement the architecture for supervisory and enterprise systems.

- **Scalable** from simple field devices to complex systems of automation equipment in the enterprise environment.

- **Open** by virtue of its use of multi-vendor, interoperable standards managed by an independent, vendor-neutral organization.
ODVA’s Approach to OPI

Four-Part Working Hypothesis

- Use of industrial Ethernet in process plants is growing and will accelerate, first with its use as the backbone for control systems and then expanding to new field devices. Ultimately it will converge multiple diverse networks and simplify the automation architecture.

- At the field level, industrial Ethernet will first be applied to devices with larger data exchange requirements such as flow meters which contain instrumentation data or control valves which contain process data). In the longer term, devices with smaller data exchange requirements, such as simple sensors and actuators, will follow as has been seen in hybrid industries.

- The scale of process automation control systems, in terms of number of devices and control loops, as well as geographic distribution of the overall system, tends to be larger than in hybrid and discrete production plants. This distribution calls for a network with a scalable architecture that can support a large number of devices and a peer-to-peer or distributed control architecture.

- The useful life of plant and equipment in automation applications in process industries will continue to be much longer than in hybrid and discrete industries. Users in the process industries will need a retrofit approach to the optimization of plant integration that accommodates an automation architecture that blends the old with the new.
ODVA’s Approach to OPI

Three Inter-related Use Cases
ODVA’s Approach to OPI

Technology Enhancements

Holistic Field-to-Enterprise Communication Architecture
- Reference network architectures to support large installations and secure remote access.
- Network messages and services to support hierarchical and peer-to-peer topologies.
- Quality of service to facilitate sharing data from the process plant with marginalizing real-time production processes.

Field Device-to-PAM Integration
- Communication and configuration interface between EtherNet/IP field devices and host systems via field device tool standards.
- Expanded electronic files for EtherNet/IP network and device configuration via CIP’s Electronic Data Files (EDS).
- Enhanced device diagnostics to provide data in a consistent, common manner for typical field devices.

Field Device-to-ICS Integration
- New and enhanced device profiles for typical field devices on EtherNet/IP.
- Proxy and translation services between installed process fieldbuses and EtherNet/IP systems.
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- Physical layer option for intrinsically safe installations using EtherNet/IP
ODVA’s Approach to OPI

OPI-enabled Chemical Dispenser

Holistic Field-to-Enterprise Communication Architecture
Next Steps

ODVA will begin Special Interest Group (SIG) work on Process Applications in 2014Q2
Strategies for Process Automation from Market Leaders & ODVA Principal Members

With its core values of vendor-neutrality, open participation and open technologies, ODVA provides the ideal forum for building consensus among market leaders in process automation.

**EtherNet/IP** is the ideal convergent and unified communication solution for realizing the next generation of productivity enhancements which are possible with a unified communication solution that leverages and makes the **Optimization of Process Integration** a reality.

Now, let’s learn about the strategy for automation applications in the process industries from market leaders and ODVA principal members - Cisco Systems, Endress+Hauser, Rockwell Automation & Schneider Electric – all of whom have collaborated inside ODVA to develop the vision for OPI.

René Pluis
Manager Global Energy Industry, Enterprise Business Segment

March 2014
The Internet of Things is Already Here

Rapid Adoption rate of digital infrastructure: 5X faster than electricity and telephony

50 Billion “Smart Objects”

![Graph showing the growth of billions of devices over time, with inflection points and World Population data.](source: Cisco IBSG, 2011)
Internet of Things: New Places In the Network (PINs)

Information Technology (IT)
- Data Center
- Campus
- Branch

Operational Technology (OT)
- Plant
- Field

- Extremely High Scale
- Bandwidth Constraints
- Cyber Security
- Determinism/Reliability
- Standards Convergence

IoT
Cisco Vision: IoT Network Platform

- Sensors and Devices
  - Location
  - Identity + Policy
  - Aggregation
  - Security
  - Mobility
  - Lightweight IPv6

- Networks, Computing, Storage
  - Scale + Reliability
  - Resource orchestration
  - Difficult networks
  - Privacy + Security
  - Service Provider M2M
  - ASICS + Software

- Data Analytics
  - Data Aggregation
  - Video Analytics
  - Streaming Data
  - Data Federation
  - Embedded analytics

- Control Systems
  - Determinism
  - Safety
  - Latency
  - Virtual Machine Control

IoT Platform

Data Center
Intelligent Network
Cloud
Architectures
Cisco Internet of Things Portfolio

- Manufacturing
- Mining
- Energy-Utility
- Oil and Gas
- Transportation
- City
- Defense
- SP/M2M

Plantwide Ethernet, Intelligent Transportation, Smart Cities, S&C Refinery, Smart Connected Vehicle, Smart Grid

**Plant Switching**
- IE 2000
- IE 3000
- CGS 1000
- CGS 2500

**Plant Routing**
- CGR 2000

**Field Network**
- CGR 1000
- 819H M2M ISR Gateway Router
- 1552 Rugged Wireless

**Embedded Networks**
- 5915 Embedded Services Router
- 3200 ESS2000

**Physical Security**
- Video Surveillance Manager and IP Cameras
- IPICS
- Physical Access Manager

**Network Management and IoT Security**

**Fog Computing**

**Data Center/Virtualization**
IoT brings Information and Operations Together

Information Technology (IT) and Operational Technology (OT)
Commitment to Architecture, Product Roadmaps: Connected Industries

Cisco Industrial Smart Solution Business Benefits

- Faster decision-making and improved performance
- Deliver real-time plant performance information across the enterprise to management and support teams worldwide
- Enable manufacturers to remotely access production automation systems for faster issue resolution on the plant floor.

- Rapid Network Deployment:
  - Quickly deploy a reliable, secure industrial network with validated and documented “Cisco Smart Business Architecture”.

- Improved Worldwide Innovation:

- Immediate Access to Systems, Devices, People:
  - View, diagnose, and control systems and process states in one click, in real-time. Collaborate globally between machines and people, suppliers and customers, design teams and decision makers.

Converged Plantwide Ethernet:
A joint Cisco and Rockwell Automation architecture

Cisco Industrial Smart Solution Products: Rugged, Secure, Reliable

- MCM Gateway: Secure, small footprint, high flexibility, modular, and powerful.
- TES-10 Access Point: Secure, robust, and easy to deploy. Supports IPv6 and IPv4, EAP, 802.11ac, and 802.11n.
- EZ2000: Compact, secure, field-hardened Layer 2 access, 802.11n, IPv6, IPv4, 802.11ac, EAP, 802.11n, and 802.11ac.
- EZ3000: Compact, secure, field-hardened Layer 3 access, 802.11n, IPv6, IPv4, 802.11ac, EAP, 802.11n, and 802.11ac.


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Purdue zoning and Ethernet / IP

- **Levels 0 – 2:** Cell / Area Zone
  - Network Connection for PLCs, HMIs, I/Os, & Drives

- **Levels 4 – 5:** Office Domain
  - Connection to industrial site through Enterprise network

- **Level 3:** Manufacturing Zone
  - Interconnection between DMZ, Cell Zones and Server Farms

- **Demilitarized Zone (DMZ):**
  - Separation between Enterprise & Control Networks
Thank you.
Optimization of Process Integration in Schneider Electric’s PlantStruxure architecture

Michel Fontvieille & Martyn Jones
ODVA Annual Meeting & Technical Conference
Phoenix, AZ 12 March 2014
Schneider Electric – A Pioneer in Industrial Ethernet

1997
Introduction of MB/TCP and ‘Transparent Factory’ for Automation

1999
Computerworld Smithsonian award winner

1997 - Innovation

2004
MB/TCP submitted for standardization in IEC 61158 and 61784

2007
Schneider Electric joins ODVA

2010
First “converged Ethernet” offers launched combining MB/TCP and EtherNet/IP

2011
SE joins ODVA Strategic Initiative for Energy

2012
SE joins ODVA Strategic Initiatives for Machinery and EtherNet/IP Marketing

2013
SE joins ODVA Strategic Initiative for Process

1990s - Innovation 2000s - Standardization Today - Proliferation
PlantStruxure
– Schneider Electric’s Process Automation System is based on an architecture with 3 pillars
Transversal functions across 3 Profiles

- Openness to the IT level
- Ready for integrated enterprise architectures
- Energy Management
- Network Transparency
- High Availability
- Safety
- Cyber Security
- Device Integration
- Libraries

- Telemetry
- Remote Architectures
- PLC+SCADA
- Plant & Infrastructure
- DCS
- Distributed Control System
ODVA’s Optimization of Process Integration

**Holistic Field-to-Enterprise Communication Architecture**
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Standardization and Transparency

- OPC/DA -> UA
- TCP/IP
- MB/TCP

- FDT DTM

- EtherNet/IP and MB/TCP at field level
- Gateways for openness to other Fieldbus standards
Make the most of your energy™

schneider-electric.com
Optimization of Process Integration:
An Overview of EtherNet/IP Value in the Process Industries

Shannon R. Foos
Process Automation Segment Manager

PUBLIC INFORMATION
Rockwell Automation at a Glance

Fiscal 2013 Sales of $6.35B

Leading global provider of industrial power, control and information solutions

Automation solutions for a broad range of industries

Serving customers for 110 years

Strong culture of integrity and corporate responsibility
Differentiating Values for the Process Industries

- **Plant-wide control capabilities**
- **Open, flexible architecture**
- **Integrated control and information**

Enterprise-wide Systems
- Supplier
- Corporate Headquarters
- Other Plant
- Customer
- OEM

Plant-wide Systems
- Receiving
- Processing
- Material Handling
- Control Room
- Batching/Blending
- Packaging
- Shipping
- Utilities
The Deep and Wide Enterprise . . .

Enterprise-wide Network

Public Information

Plant-wide / Site-wide Network
Driving Efficiencies . . .

The Wide Enterprise: Increase ‘make’ velocity

The Deep Enterprise: Increase ‘market’ velocity
The 3 OPI Use Cases

1. Standard integration methods for traditional process networks
   Enablers for EIP Field Instrumentation

2. Focus on Device Integration Technologies

3. Extend System Features, including Security to Connected ‘Things’
Shannon R. Foos
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Optimization of Process Integration

How it fits to Endress+Hauser’s strategy.
Endress+Hauser: The legacy

- Endress+Hauser is a leading manufacturer of field devices for the process industries
- Measuring and registering all process variables
- With all required process connections
- Operating reliably in all industries worldwide

All process variables | All industries | All process connections
Endress+Hauser focus industries

After success within the hybrid industries Ethernet will go to the field of process industries.
"Optimization of Process Integration" at Endress+Hauser

**Ethernet to the field**

- **Engineering station**
- **Operator Station**
- **Plant Asset Management**

"4-wire" devices

EtherNet/IP

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Slide 40  03/12/2014  Olivier Wolff
Ethernet to the field: requirements

"2-wire" devices
Power over Ethernet

"4-wire" devices
EtherNet/IP

Slide 41   03/12/2014   Olivier Wolff
Ethernet to the field: requirements

- Engineering station
- Operator Station
- Plant Asset Management

“2-wire” devices
Power over Ethernet

“4-wire” devices
EtherNet/IP

“2-wire” devices
Intrinsic safe Ethernet
Integration into classical fieldbus architectures

Field Device-to-ICS is already a reality
Intelligent field devices and diagnostic information

Analogic techniques

Value >20mA

Failure

“Error – Level in blocking distance”

Digital techniques

“Error – Level in blocking distance”

Out of Specification

Intelligent field devices are enabling Field Device-to-PAM Integration
Plant Asset Management

- Device Configuration Management
- Asset Information Management
- Maintenance Management
- Calibration Management

“2-wire” devices
Power over Ethernet

4-wire” devices
TP Ethernet

“2-wire” devices
Intrinsic safe Ethernet
Field device management over the life cycle

- Manage asset information over total life cycle
- Asset information set starts at production
- Additional information at every step of life cycle

Enabled by Holistic Field-to-Enterprise Communication Architecture
Time for Discussion

Optimization of Process Integration

Holistic Field-to-Enterprise Communication Architecture

Field Device-to-Plant Asset Management Integration

Field Device-to-ICS Integration