Endress+Hauser your competent partner for EtherNet/IP

EtherNet/IP is leveraging your process needs!
EtherNet/IP facts

- EtherNet/IP (Ethernet Industrial Protocol) is an open communications protocol developed in the late 1990’s by Rockwell Automation.
- EtherNet/IP was designed for use in process control and other industrial automation applications.
- EtherNet/IP makes use of existing network infrastructure (Ethernet) so no special hardware is required to implement it.
- EtherNet/IP is built on the standard TCP/IP suite so no special software is required.
- EtherNet/IP is managed by the ODVA
- Endress+Hauser in principal member of ODVA
EtherNet/IP – ISO/OSI Model

- EtherNet/IP is compatible with commercial, off-the-shelf products and media, and complies with IEEE 802.3/TCP/UDP/IP standards and conventions.
- Producer/Consumer Model
- I/O data exchange: Implicit Messages transported over UDP (time critical)
- Device-Configuration and Diagnostics-Delivering: Explicit Messages (Client-Server-Telegrams) are transported over TCP
From Ethernet to Industrial Ethernet

Let’s not be starry-eyed!

- There are significant differences between Ethernet for office/home networks and industrial networks
- Industrial Ethernet versus Ethernet for office/home networks follows extended specifications regarding
  - robustness → mechanical, environmental, electrical
  - network topologies → line, ring, redundant ring
  - network dimensions → geographically extended networks
  - very short reaction time → mainly for fast processes in factory automation, in specific applications also in process automation to enable it for industrial use
Benefits

One single network architecture from ERP to the field

- **Simplicity and speed** for engineering, integration and commissioning of field devices
- **Higher bandwidth** for more services running in parallel on “highway of data”.
- **More flexible**, modular field infrastructure installation.
- **Fewer networks** and hardware to engineer, configure, commission and maintain.
- **Easier integration** into existing Ethernet installations and corporate networks, no special requirements or conditions to meet.
Advantages within CAPEX

- Twisted pair cables
  - Many I/O Modules (RIO and cards)
  - All configuration done at meters
  - One-way communication
  - Installation errors (loop power wiring, wrong terminals)
Advantages within CAPEX

- Single “Ethernet” cable
  - Only one cable to connect (faster install)
  - Simplified electrical schematics
  - No scaling needed
  - No additional I/O modules needed
  - Two-way communication
Project Achievements and Experiences

Installation and commissioning of coriolis mass flow measurements into PlantPAx by using EtherNet/IP.

- **40% reduction in commissioning time**
  - No scaling of outputs required because of digital communication.
  - Add On Profile (AOP) parameters satisfies application.
  - Integrated web server to access process variables and diagnostic data.

- **25% reduction in process control loop and integration efforts**
  - Creation of process control scheme by unique process parameter drag and drop.
  - Ability to replicate saved PID loop for identical process loops.
  - Reduction HMI code effort by using preconfigured faceplates.
What do you get out of the device?

One Process Value
E.g.: Flow

Multiple Process Values
E.g.:
- Mass flow
- Volume flow
- Temperature
- Density
- Viscosity
- Totalizer
- Device diagnostics
- ...

Endress+Hauser your competent partner for EtherNet/IP
Demand for Industrial Ethernet in the field for process automation will initially emerge out of the hybrid industries.
Product Portfolio Food&Beverage/Life Sciences industries

Coriolis flowmeters
- Proline Promass100
- Promass83

Electromagnetic flowmeters
- Proline Promag100
- Promag53

Liquid analysis
multichannel measurement
Application example: Standardization of Milk

Standardization of milk

EtherNet/IP

fresh milk
standardized cream
standardized milk
Application example: CIP
Product portfolio environmental industries

Electromagnetic flowmeters

Proline Promag 400

Liquid analysis
multichannel measurement

Liquiline CM44
Product portfolio environmental industries

Liquistation sampler

With built-in Liquiline CM44
Product portfolio extension to come

WirelessHART Gateway
Backbone for integration of “loop-powered devices”
EtherNet/IP Architecture

Endress+Hauser your competent partner for EtherNet/IP

Engineering station

Operator Station

Plant Asset Management Station

ICS Industrial Control System

Native 4-wire field devices

04/06/2015

Jim Coveart / Olivier Wolff
**Premium Integration: Add On Profile (AOP) Level 3**

1. **Add On Profile Level 3**
   - Coriolis flow device in I/O configuration
   - Automatic creation of data structure

---

**Table:**

<table>
<thead>
<tr>
<th>Name</th>
<th>Value</th>
<th>Data Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>EH_mass.Mass_Flow</td>
<td>58, 625,83</td>
<td>REAL</td>
<td>EH_Promass 8310</td>
</tr>
<tr>
<td>EH_mass.Volume_Flow</td>
<td>58, 952,732</td>
<td>REAL</td>
<td>EH_Promass 8310</td>
</tr>
<tr>
<td>EH_mass.Corrected_Value</td>
<td>3, 497,704</td>
<td>REAL</td>
<td>EH_Promass 8310</td>
</tr>
<tr>
<td>EH_mass.Density</td>
<td>994, 329</td>
<td>REAL</td>
<td>EH_Promass 8310</td>
</tr>
<tr>
<td>EH_mass.Rectified_Density</td>
<td>1000, 432</td>
<td>REAL</td>
<td>EH_Promass 8310</td>
</tr>
<tr>
<td>EH_mass.Temperature</td>
<td>23, 801,714</td>
<td>REAL</td>
<td>EH_Promass 8310</td>
</tr>
<tr>
<td>EH_mass.Totalizer1</td>
<td>362, 934</td>
<td>REAL</td>
<td>EH_Promass 8310</td>
</tr>
<tr>
<td>EH_mass.Totalizer2</td>
<td>4582, 156, 0</td>
<td>REAL</td>
<td>EH_Promass 8310</td>
</tr>
<tr>
<td>EH_mass.Totalizer3</td>
<td>4154, 994</td>
<td>REAL</td>
<td>EH_Promass 8310</td>
</tr>
</tbody>
</table>

---

**Slide 19 Jim Coveart / Olivier Wolff**
Premium Integration – Add On Instruction (AOI) and Faceplates

- A global object links the tag name to the faceplate
- Real time display of all process variables
- Alarms, Trends, Reset Totalizers

Available within “Library of Process Objects” of PlantPAx
Premium Integration for Process Industry

Integrated Device Package

- **Electronic Data Sheets (EDS)**
  Can be downloaded from Internet and from device
  EDS files are used to identify and commission the device on a network.

- **Add-On Profile (AOP)**
  Can be downloaded from Internet
  AOP standardize module configuration, reduce programming and configuration errors and increase productivity.

- **Declaration of Conformity (DOC)**
  Can be downloaded from Internet or ODVA website

- **System Integration Document**
  can be downloaded from Internet
  Provides a step-by-step approach for integrating a device

- **Add-On Instruction (AOI) and Faceplates**
  Available within the PlantPAX Library of Process Objects
Supported Integration into automation systems

- Integration with EDS File
- Integration with device DTM (to come)
- Automatic creation of data structure
- Device in DTM Tree

Integration of Promass 100 in Unity
An empty or partially filed pipe in process application could damage running equipment in the process.

"My pipe is partly filled"

Note: in 4-20mA technology, only failure current shown.

Intelligent and connected field devices unlock diagnostic information to help taking business decision!
Field device diagnostics: easy classification

- Device diagnostics are classified into 4 categories

- NE107 implemented like any other protocol
- Currently under standardization by ODVA

Diagnostic categories are according to:

- NAMUR
- NE 107

Self-Monitoring and Diagnosis of Field Devices

Failure | Control check | Out of specifications | Maintenance required
---|---|---|---
❌ | 🛠️ | 🚹 | 🐤

ex. Control, Maintenance, State recognition

Slide 24  04/06/2015  Jim Coveart / Olivier Wolff
Endress+Hauser your competent partner for EtherNet/IP

**Easy device configuration**

The integrated Web server provides an overview of all the measured values and the actual/previous system conditions in compliance with NAMUR NE107 including cause/remedy.
Plant Asset Management compatibility

Support of FDT/DTM technology

Integration into FieldCare
EtherNet/IP conformance tested devices

Sort By Manufacturer

Endress+Hauser
  Liquiline CM44x
  Promag 100
  Promag 400
  Promag 53
  Promass 100
  Promass 83

Network Features Supported

- Device Profile Type:
- Generic Device 0x2B
- Total CIP Connections Supported:
  - Total Max # of connections: 10
- Explicit Messaging:
  - Originator Max # of connections: 10
  - Max # of connections: 10
- I/O Messaging:
  - (Scanner) Max # of connections: 10
  - Target (Adapter) Max # of connections:
- CIP Safety Node:
  - Vendor Specific
  - Safety Discrete I/O
- Device Configuration Options:
  - Hardware Switches
  - EDS
  - EDS File Instance in Device
  - Parameter Objects
  - Custom Software
- MAC Parameter Configuration:
  - Speed: 10Mbps, 100Mbps, Auto, Manual
  - Duplex: Half, Full, Auto, Manual
- Address Configuration:
  - Hardware Switches
  - BootP
  - DHCP
  - Custom Software
Endress+Hauser your competent partner for networking

Full & complete range of instruments

Digital communication

Full set of 3rd party interfaces and network components

- Consulting and training services
- Network engineering & design in process industry
- Complete MRO services for life cycle support

Added value services
Execution and support

- Guidelines and procedures for efficient Startup-commissioning
- Integration tests and documentation

Integration, setup and configuration Competencies

Tested and proven!
Training services for Industrial Ethernet

- Technology Trainings
- Fundamentals Industrial Ethernet (Web Based Training)
- Basic Industrial Ethernet
- Advanced Industrial Ethernet
Endress+Hauser your competent partner for EtherNet/IP

System World - Fieldbus Test and Competence Center

- Endress+Hauser maintains an Fieldbus Test and Competence Center ‘System World’ located in Reinach (CH) where most common process control systems and fieldbuses are represented used for system integration testing in a multi-vendor environment.

System World Virtual Tour
One slide: EtherNet/IP today at E+H

Portfolio

- **Food&Beverage and Life Sciences**
  - CM44xR,
  - Promass100, Promag100,
  - Promass83, Promag53
- **Environmental**
  - CM44x, CSF34, CSF48
  - Promag400,

“Premium Integration” Package

- Add-On Profile (AOP) level 3
- Tools (Faceplates, Add-On Instructions) available within Library of Process Objects of PlantPAx
- Integration Documents

Supported Integration

- Schneider Electric

Configuration and Diagnostics

:Webserver, CDI TCP/IP, NE 107

Plant Asset Management

- FieldCare support (2.10)

Endress+Hauser your competent partner for EtherNet/IP

Endress+Hauser principle member of ODVA, supporting the EtherNet/IP protocol

Today’s Limitations

- Not for use in hazardous areas
- Separated communication and power
- Distance between active components on copper <80m
Any questions?