Proudly present …

Ethernet to the Field (APL)
Supporters

A large collaboration effort in automation supported by:

- ABB
- Endress+Hauser
- Krohne
- Pepperl+Fuchs
- Phoenix Contact
- Rockwell Automation
- Samson
- Siemens
- Stahl
- VEGA
- VEGA
- Yokogawa
Process Industries Demand

- Long cable distance
- Easy and robust connection
- Power and communication via one cable
- Protection methods for explosion hazardous area

Ethernet based field devices rarely deployed in today’s process automation facilities
Ethernet-APL Goals

Advanced Physical Layer will bring the benefits of industrial Ethernet to process automation and instrumentation, PLUS . . .

- A converged **long-distance** communication network for process automation and field instrumentation.

- Ability to locate Ethernet-based field devices in hazardous areas by virtue of being **intrinsically safe**.

- **Two-wire** using industry standard fieldbus cable with **loop-powered devices**.

- Increased bandwidth provided by **10 Megabit, full-duplex** Ethernet communication enables productivity gains over the lifecycle of field devices.
Serving the Special Requirements of Process Industries

- One Standardized Ethernet Physical Layer:
  - Ethernet-based, for any protocol or application
  - Power and data over a twisted-pair line
  - Re-use of existing two-wire cable
  - Explosion hazardous area protection with intrinsic safety, including simple validation
  - Transparent connection to any IT network
  - Supports the familiar trunk-and-spur-topology
  - Device access anytime and anywhere
  - Fast and efficient communications
Milestones and General Timeline

IEEE 802.3cg Task Force: Enhancements to IEEE completed

Industrial Ethernet specifications updated

First infrastructure and field devices expected to be available

2019 2020 2021
Timeline

- Task Force and Working Group Review
- IEEE standards board approval

2018
- Contribution to 802.3cg Task Force

2019
- Specification of hazardous area protection methods, port profiles, etc
- Specification of conformity/tests

2021
- IEC standardization

Major steps for APL project
Ethernet in the Field of Process Plants

Legend
- Facility or Plant Ethernet
- Field Ethernet
- Redundancy Ring (option)
## Specifications for the Advanced Physical Layer

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standards</td>
<td>IEEE 802.3 (10BASE-T1L), IEC 60079</td>
</tr>
<tr>
<td>Power supply output (Ethernet APL power switch)</td>
<td>Up to 60 W</td>
</tr>
<tr>
<td>Switched network</td>
<td>Yes</td>
</tr>
<tr>
<td>Redundant cable and switches</td>
<td>Optional</td>
</tr>
<tr>
<td>Reference cable type for intrinsic safety</td>
<td>IEC 61158-2, Type A</td>
</tr>
<tr>
<td>Maximum trunk length</td>
<td>1000 m / into Zone 1, Div. 2</td>
</tr>
<tr>
<td>Maximum spur length</td>
<td>200 m / into Zone 0, Div. 1</td>
</tr>
<tr>
<td>Speed</td>
<td>10 Mbps, full-duplex</td>
</tr>
<tr>
<td>Hazardous area protection:</td>
<td>For all zones and divisions.</td>
</tr>
<tr>
<td>Inspired by fieldbus</td>
<td>With optional intrinsic safety at the device</td>
</tr>
</tbody>
</table>
### Just Another Physical Layer: The ISO OSI Model

<table>
<thead>
<tr>
<th>Layer</th>
<th>Protocols</th>
</tr>
</thead>
<tbody>
<tr>
<td>1: Physical Layer</td>
<td>Ethernet, Fast-Ethernet, Gigabit, WIFI, ...</td>
</tr>
<tr>
<td>2: Data Link Layer</td>
<td>Ethernet, RT/IRT, TSN</td>
</tr>
<tr>
<td>3: Network Layer</td>
<td>IP</td>
</tr>
<tr>
<td>4: Transport Layer</td>
<td>TCP</td>
</tr>
<tr>
<td>5-7: Session/Presentation/Application Layer</td>
<td>Ethernet/IP, HART-IP, OPC UA, PROFINET, http, ...</td>
</tr>
</tbody>
</table>

Higher layers operate independent of the physical layer.

APL is one of many physical layers.
Ethernet-APL for all Hazardous Areas
Explosion Hazardous Area Protection

- Intrinsic safety, an integral part of the design:
  - Planning and validation concepts similar to FISCO
    - Certified components
    - Plan and document only
  - Easy deployment for any hazardous area
  - Live work on spurs permitted without permit
Explosion Hazardous Area Protection

- Increased safety for home run / trunk
  - High-power-trunk concept for long cable runs
  - Same infrastructure planning with and without ignition protection
Ethernet in the Field of Process Plants

- Engineering
- Control
- Asset Management
- Optimization & Monitoring

Legend:
- Facility or Plant Ethernet
- Increased Safety
- Intrinsic Safety
- Redundancy Ring (option)

General purpose area up to Zone 2 / Div. 2

Zone 1 / Div. 2

Zone 0 / Div. 1

A Unified Vision for a Smarter Industry
For More Information

- White Paper on APL
  - https://www.profibus.com/apl
  - https://go.fieldcommgroup.org/EthernetToTheField
  - https://www.odva.org/ opi