FIREWORKS IN THE ETHER

Get ready now for emerging technology and standards that will take industrial Ethernet to new heights.
New technologies and standards for Ethernet are emerging that will create fireworks in the industrial automation market. New market opportunities will be created for industrial Ethernet for network convergence, edge devices and accelerating migration from traditional fieldbus to industrial Ethernet. In this session, a panel of EtherNet/IP subject matter experts will share their insights on how new technologies and standards for:

- Single-Pair Ethernet
- Time Sensitive Networking
- Constrained Node Networks

will impact industrial Ethernet and EtherNet/IP in specific.

Panelists

- David Brandt, ODVA liaison to IEEE 802.3
- Bob Voss, ODVA Chairman of EtherNet/IP Physical Layer SIG
- Joakim Wiberg, ODVA CTO
- Jordon Woods, ODVA liaison to IEEE 802.1
- Harry Forbes, panel moderator and lead technical analyst to ODVA from ARC Advisory Group
Scope of New Technologies and Standards for Industrial Ethernet

- **Constrained Network Nodes**
  - (Simplified EtherNet/IP stack)
  - + Single Pair PHYs)

- **Converged Network Traffic**
  - (Time Sensitive Networking – TSN)
  - **Low Cost, Long Reach**
    - (Single Pair Ethernet – 10BASE-T..)
Scope of New Technologies and Standards for Industrial Ethernet

Relevant SDOs and Standards
ODVA: The EtherNet/IP Specification
IEEE Standards Association: 802
IETF: RFC 7228 and related
IEC/IEEE: 60802
IEC: 60079, SC48B
TIA: 42.9

Part of Landscape
APL Project: Ethernet to the Field (Cooperation b/t ODVA, Fieldcomm Group and PI)
AVnu: conformance test plans for TSN
Industrial Internet Consortium: TSN Testbed
Lab Networks Industrie 4.0
OPC Foundation: data access via OPC UA over TSN-enabled networks

CONVERGED NETWORK TRAFFIC
(Time Sensitive Networking – TSN)
LOW COST, LONG REACH
(Single Pair Ethernet – 10BASE-T..)

CONSTRANDED NETWORK NODES
(Simplified EtherNet/IP stack) + Single Pair PHYs)
Low Cost, Long Reach

Single Pair Ethernet

Incorporated in IEEE 802.3 Ethernet standard as 10BASE-T1S and 10BASE-T1L (currently known as IEEE 802.3cg)
+
amends IEEE 802.3bu for optional Power)
Network Convergence

Time Sensitive Networking

Incorporated in IEEE 802.1

Pillars of TSN=
1. Time synchronization
2. Bounded low latency
3. Ultra-reliability
4. Resource management

Key to Technology and Standards

ODVA Common Industrial Protocol (CIP)
CIP and EtherNet/IP Objects
Internet Engineering Task Force RFCs
IEEE Standards

NEW! changes to standards

802.1 Data Link (with Ethernet Media Access Control)
802.3 Ethernet PHYs
Network Convergence

Data has become a commodity, flexible data access is a must

Embrace “sharing the wire”

Source: “An Interoperable Ecosystem Through Common Standards and Testing – TSN/A Conference 2018
Constrained Node Networks

New EtherNet/IP options
- Reduced firmware
- Reduced hardware
- Optimized cabling/connectors
- Building blocks for low power wireless

Constrained Network Nodes
(Simplified EtherNet/IP stack + Single Pair PHYs)

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- CIP and EtherNet/IP Objects
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- IEEE Standards
- NEW! changes to Standards

EtherNet/IP Stack ELIMINATIONS for constrained network node
- Optional attributes and services, multicast, CIP routing
- Class 3
- Session
- TCP ENCAP
- TLS
- TCP Protocol and Ports
Impact to EtherNet/IP Developers

Design Considerations
- Think about integrating a generic application interface between TCP and UDP
- Segment TSN functionality so that it’s only included in devices where it’s needed – not likely to be needed in constrained node devices.

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NEW! changes to standards

EtherNet/IP Stack ELIMINATIONS for constrained network node
- Optional attributes and services, multicast, CIP routing
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Think about integrating a generic application interface between TCP and UDP. Segment TSN functionality so that it’s only included in devices where it’s needed – not likely to be needed in constrained node devices.
What OPPORTUNITIES will Single Pair Ethernet, TSN and Constrained Node Networks create?

Enterprise Systems

Manufacturing Execution Systems

Supervisory Systems for Automation Assets

Automation Assets for Manufacturing Processes

Real-time and Safety Controllers (DCS, PAC, PLC)

Network Infrastructure for Automation and IIOT Assets

Ethernet Switch

Ethernet Switch

Ethernet Switch

Spur

APL Power Switch

Ethernet Switch

Automation and IIOT Assets for Control, Safety, Sensing and Actuating

In-cabinet Automation Devices for Control/Safety

On-Machine Automation Devices for Control/Safety

On-Machine Automation Devices w/ high availability

In-Field Automation Devices w/o Ft.

loop power

In-Field IIOT Devices

IIOT Devices for Sensing and Actuating

Cyberspace and IIOT Systems