IEEE 802.3
Call for Interest
Enhancements to Single Pair Ethernet
Closing Report

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ADI, APL Group, Cisco, CommScope, Marvell, SenTekSe

Electronic Plenary

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CFI Request

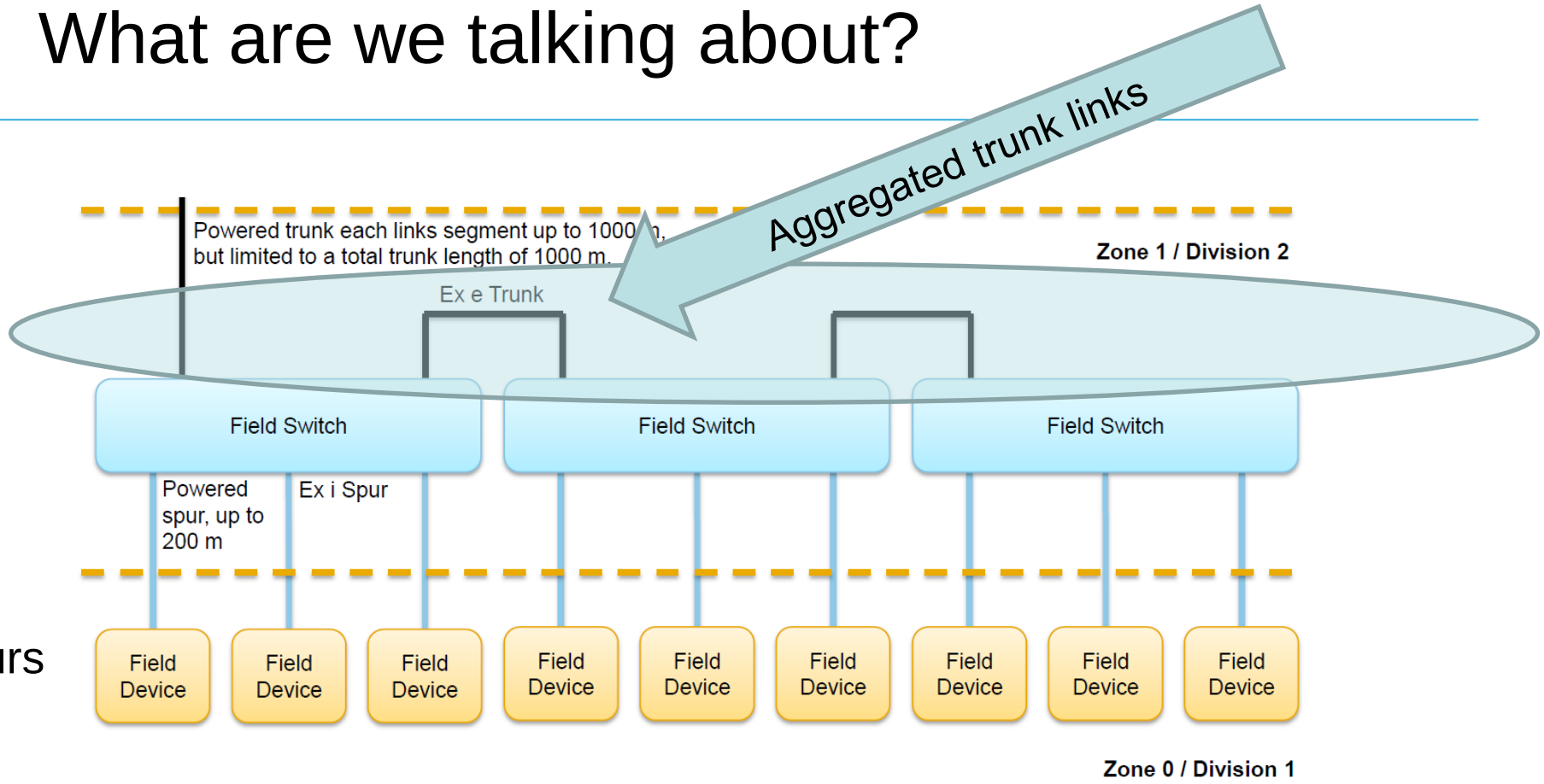
With the conclusion of IEEE Std 802.3cg-2019, the Ethernet Standard has renewed interest in Ethernet at lower speeds. Renewed interest has broadened the application areas. This has already spawned a project for enhancements to the 10 Mbps shared-media (aka multidrop) operation on mixing segments in IEEE P802.3da; however, the point-to-point PHYs are outside the written scope of the IEEE P802.3da PAR. This call for interest is to consider enhancements related to the use of the point-to-point operation in single pair ethernet, including for example, use of 10BASE-T1L with MACMERGE. The proposed study group would explore any needed enhancements to use the new PHYs in Time-Sensitive Networking (TSN) and industrial networking environments.

What are we talking about?

Process control trunks

Building automation trunks

- Later evolution to spurs likely



This has two parts: Near-term (initial 10BASE-T1L deployments), and Long-term (providing a next speed for growth 4-5 years from now)

Near term / Long term

SPE networks deal in time-sensitive traffic

Networks for tens of thousands of SPE nodes expected

Installed wiring takes time to upgrade

So, What's the Problem?

- Clause 99.1 in IEEE Std 802.3-2018:
  "specifies an optional MAC Merge sublayer for use with a pair of full-duplex MACs and a single PHY operating at 100 Mb/s or higher on a point-to-point link"
  - This makes perfect sense in that many 10 Mb/s PHY do not support the PCS and thus will not recognize the the SMD which is the Start of Mpacket Delimiter
  - However the newer 10 Mb/s PHY technologies (T1L and T1S) do support the PCS and will work with the MAC Merge sublayer
- Other TSN features (scheduled traffic, FRER, ATS, etc.) are already compatible with these PHY technologies.

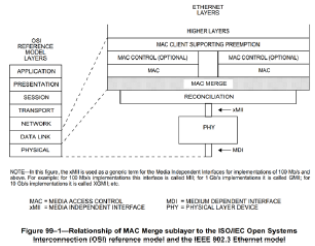


Figure 99–1—Relationship of MAC Merge sublayer to the ISO/IEC Open Systems Interconnection (OSI) reference model and the IEEE 802.3 Ethernet model

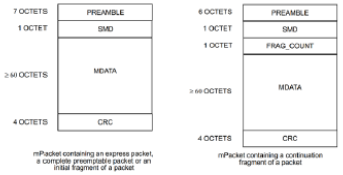


Figure 99–4—mPacket format

What is the Next step for T1L?

- Desire to use existing cable/topologies
  - E.g., fieldbus type A (35 MHz), 16-18 AWG (1.5-0.75mm^2)
  - MUCH less insertion loss/meter than automotive cabling
- Differing views
  - Rate: 100 Mbps? 1 Gbps?
  - Reach: 100m, 200m, 500m, 1km
- Varying complexity solutions

GETTING CONSENSUS ON THIS IS WHAT A STUDY GROUP IS ABOUT

Why now

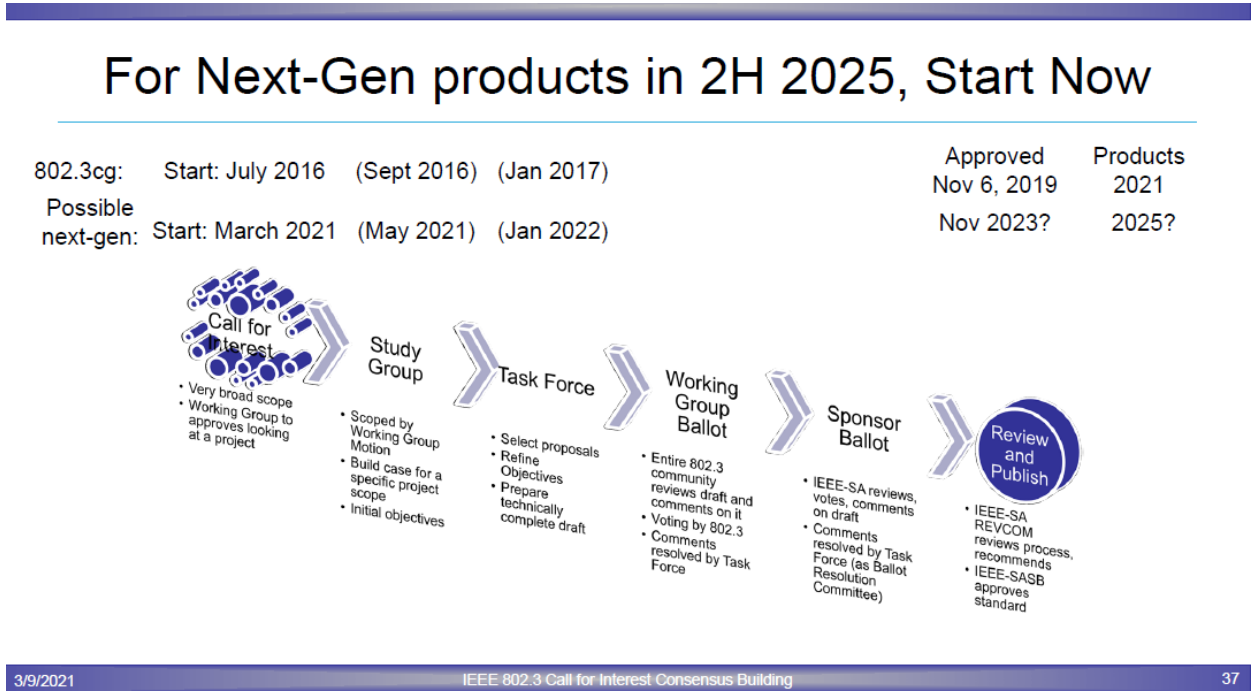
10BASE-T1L products are launching now

- TSN support is expected, and in demonstration

Silicon and EVKs for 10BASE-T1L PHYs are in the market from multiple vendors

Public Demonstrations of 10BASE-T1L products are scheduled for mid-2021

Next generation is needed in 2025-2026 to meet expected demand



Broad Industry Support

Supporters & Contributors

Tim Baggett – Microchip
Piergiorgio Beruto - CanovaTech
David Brandt – Rockwell Automation
Theo Brillhart – Fluke
Steve Carlson – High Speed Design
Clark Carty – Cisco Systems
John D'Ambrosia - Futurewei
Chris DiMinico – MC Communications
Lars Ellegard – Microchip
Peter Fischer – BKS Kabel-Service AG
Matthias Fritsche – HARTING
Michael Hilgner - TE
Wayne Hopkinson – Commscope
Bernd Horrmeyer – Phoenix Contact
Gergely Huszak – Kone
Chad Jones – Cisco
Peter Jones - Cisco
Ragnar Jonsson – Marvell
Jannis Kappertz – Endress+Hauser
Beth Kochuparambil – Cisco
Martin Leihenseder – Wurth Elektronik
Jon Lewis – Dell EMC
Thomas Leyrer – Texas Instruments
Stefan Lueder – Siemens
Kent Lusted - Intel

Supporters & Contributors

Valerie Maguire – Siemon Company
Mick McCarthy – ADI
Brett McClellan - Marvell
Geet Modi – Texas Instruments
Harald Mueller – Endress+Hauser
Mark Nowell – Cisco Systems
Martin Ostertag – Zurich University of Applied Sciences
Christopher Pohl - Beckhoff
Jason Potterf – Cisco Systems
Thomas Rettig - Beckhoff
Dieter Schicketanz – Reutlingen University
Guenter Steindl – Siemens
Heath Stewart - ADI
Bob Voss – Panduit
Ludwig Winkel – L.A.N. Winkel Consulting
Jordon Woods - ADI
Peter Wu - Marvell
Dayin Xu – Rockwell Automation
James Young – Commscope
George Zimmerman – CME Consulting
Steve Zuponcic – Rockwell Automation

At the time of the CFI, 46 supporters from 30 affiliations, including affiliation with OEM systems, cabling, semiconductor, and industrial networking segments

Two related questions, one SG

(I expect) Two potential PARs from this CFI:

- Short term – TSN Enhancements for point-to-point SPE
- Long term – At least one next generation point-to-point SPE (T1L) PHY

NOTE – Multiple PARs from a Study Group are allowed, and this is being done for efficiency, because the interest groups are largely the same, and to transparently avoid “PAR-splitting” in the future.

If these do not each produce a PAR by the same NESCOM meeting, a new CFI presentation/study group formation will need to be requested for the lagging task

Specifically, multidrop, and hence PLCA would be out of scope of the proposed *point-to-point* effort

- (see IEEE Std 802.3cg-2019 Clause 148 introduction)
- Multidrop enhancements are 802.3da

CFI Consensus Presentation

A consensus building presentation was held Tuesday, March 9

- CFI Consensus Presentation: https://www.ieee802.org/3/minutes/mar21/SPE_enh_CFI%20draft_v0p9_2.pdf

Straw Poll Summary:

1. Should a study group be formed to study Enhancements to point-to-point Single Pair Ethernet to:

   support TSN

   And support increasing traffic and speed needs with long reach point-to-point higher-speed single-pair PHYs

2. I would participate in the “Enhancements to point-to-point Single Pair Ethernet” Study Group in IEEE 802.3
3. I believe my affiliation would support my participation in the “Enhancements to point-to-point Single Pair Ethernet” Study Group in IEEE 802.3

153 attendees (per IMAT)

1. Y: 104
   N: 1
   A: 13

2. Tally: 54

3. Tally: 46

Motion:

Move that the IEEE 802.3 Working Group request the formation of a Study Group to develop Project Authorization Requests (PAR) and Criteria for Standards Development (CSD) responses for Enhancements to point-to-point Single Pair Ethernet to:

1. Support TSN, and
2. Support increasing traffic and speed needs with long reach point-to-point higher-speed single-pair PHYs

M: George Zimmerman

S: Harald Mueller

Questions?

Thank you!