IEEE 802.3
Call for Interest
Enhancements to Single Pair Ethernet
Overview

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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.

Overview: Motivation

- Emerging use of Single Pair Ethernet in Operational Technology Networks has brought to light needed enhancements to 802.3 related to the point-to-point 10 Mb/s PHYs added by IEEE Std 802.3cg-2019, as well as the related need to begin work on the next stage of SPE growth for point-to-point.

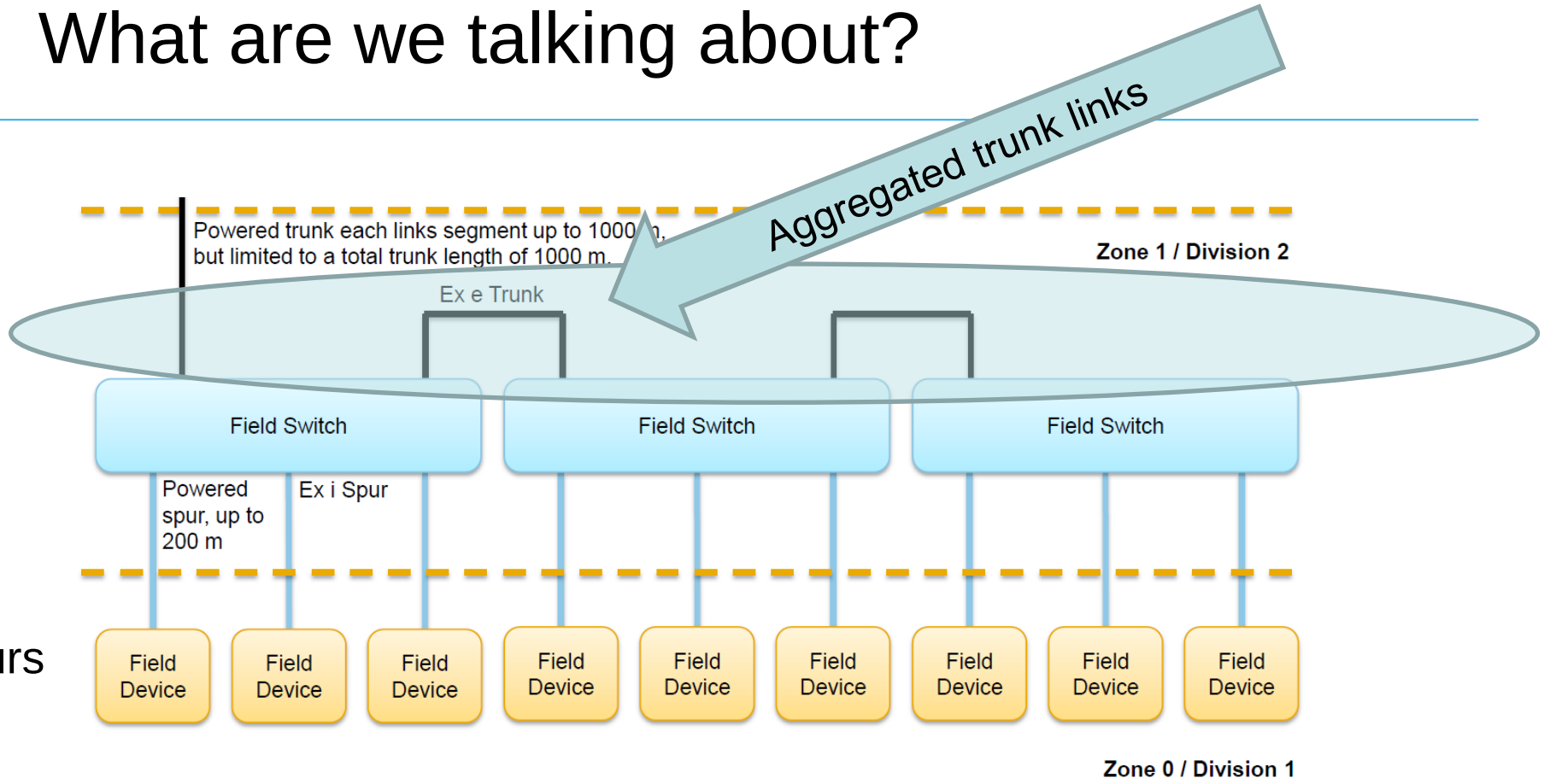
- (At least) Two potential PARs from this CFI:
  - Short term – TSN Enhancements
  - Long term – Next generation point-to-point SPE (T1L)
- Specifically, multidrop, and hence PLCA would be out of scope of the proposed *point-to-point* effort
  - Multidrop enhancements are 802.3da
  - For PLCA, see IEEE Std 802.3cg-2019 Clause 148 introduction

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)

PART I: 10BASE-T1L and TSN

10BASE-T1L is included in the list of Common PHY and MAC Options (5.6.1) of IEC/IEEE 60802d1.2

- For Process Automation, 10BASE-T1L is an essential technology to replace various legacy technologies for relatively long distances and in harmful environments

There are some gaps that need to be discussed and addressed

- 10BASE-T1L and Frame Preemption / MAC Merge sublayer → 802.3!
- 10BASE-T1L and IEEE 802.1AS-2020 Link Delay Threshold → 802.1
- 10BASE-T1L and IEEE 802.1AS-2020 Performance Requirements → 802.1

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.

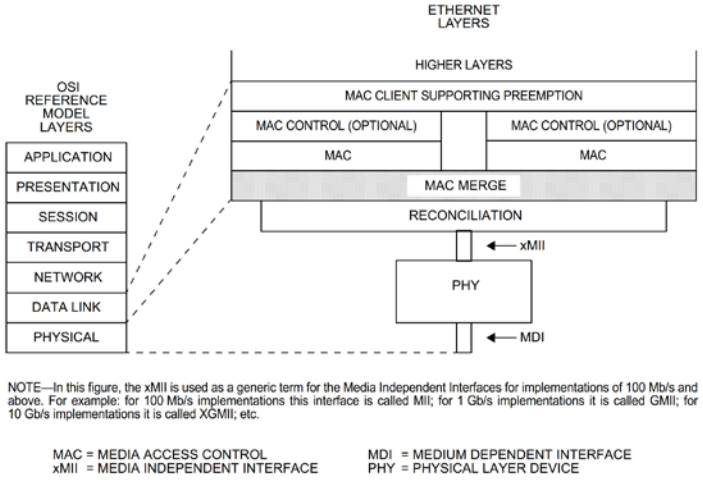


Figure 99–1—Relationship of MAC Merge sublayer to the ISO/IEC Open Systems Interconnection (OSI) reference model and the IEEE 802.3 Ethernet model

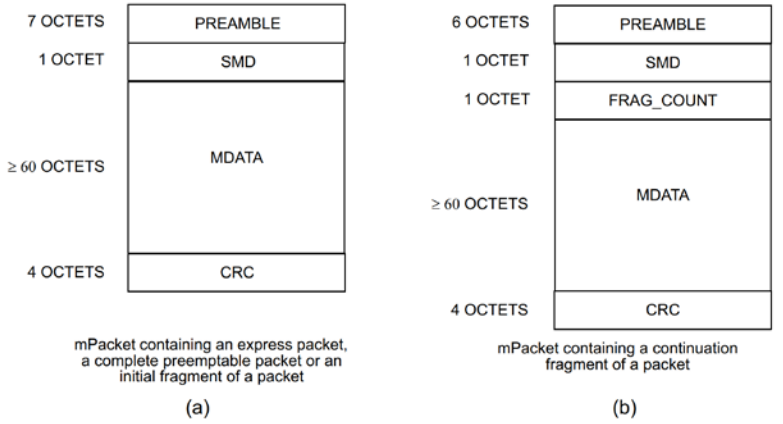


Figure 99–4—mPacket format

What 802.3cg forgot: MAC Merge for 10BASE-T1L

99. MAC Merge sublayer

99.1 Introduction

This clause 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. The two MACs are:

Source: IEEE Std 802.3-2018

- Speed limitation was an easy way for Clause 99 to avoid old, 'legacy' PHYs
  - ❖ BUT: 10BASE-T1L is architected like modern, >100 Mb/s PHYs (MII -> PCS -> PMA, full duplex)
- Why not Maintenance? – New feature
- Does it work? Did we forget anything else?

PART II: The Next Speed? From 10 Mb/s?

- Filling in the SPE ecosystem
  - As SPE spur deployment fills out, this will put pressure on the trunks
  - Traditionally, Ethernet has provided a higher speed
- What is the right speed for long-reach SPE trunks as 10BASE-T1L deployment grows
- This is NOT about a new Ethernet Speed
  - But the time is now to begin the discussions for a new PHY speed to support needs 5 years from now as SPE grows

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

- SPE (10BASE-T1L) chipsets/eval boards available now from multiple vendors
- SPE system products in 2021
  - Certification and Demonstrations in process for mid-year 2021
- Standards timeline is longer for next generations
  - More options, learning feedback
    - Next generation needed 2025-2026

802.3cg:	CFI: July 2016	Standard Approved Nov 2019	Products in 2021
Next gen?:	CFI: March 2021	Standard Approved Nov 2023?	Products in 2025?

Logistics

An overview presentation session will be given to support consensus building:

- Date – Tuesday, 9 March 2021
- Time – 1500-1700 UTC (7-9AM US Pacific Time)

Location – zoom meeting:

https://Dell.zoom.us/j/99737115638?pwd=allHM2FLTWFxYkhPSFNJRkJ2OS92Zz09

Join from a browser: https://Dell.zoom.us/wc/join/99737115638 Password: 437408

- CFI Presentation:
  - https://www.ieee802.org/3/cfi/request_0321_1.html

Request to form Study Group will occur during the mid-session 802.3 WG Plenary

Questions?

Thank you!