



802.3cg PAR and CSD issues, using D2.4 Draft (current as of this PDF)

Most to do with CL148 PLCA RS in the draft, with a few issues with CL147 10BASE-T1S.

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From 802.3 WG Ballot Announcement

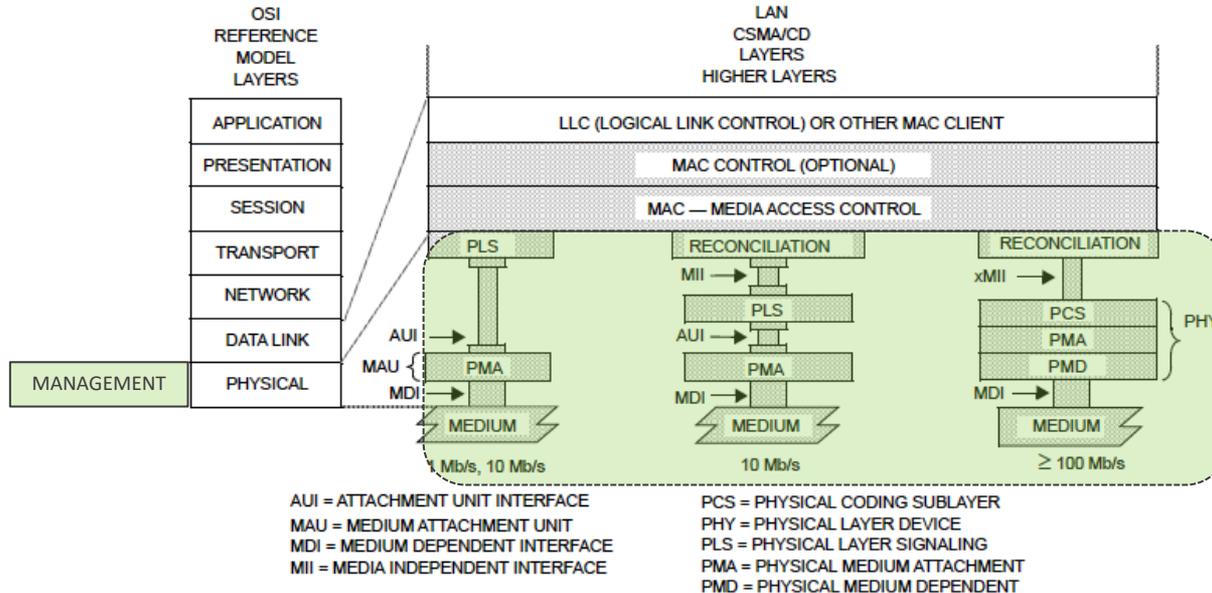
“...One of the responsibilities as a balloter is to ensure that draft is consistent with the criteria for standards development (CSD) responses which are available at <<https://mentor.ieee.org/802-ec/dcn/18/ec-18-0079-00-ACSD-802-3cg.pdf>>. An Approve vote indicates your agreement that the draft is consistent with the CSD responses...”

- There are enough serious concerns that this draft is not consistent with the CSD responses.
- In addition, there is enough serious concerns that this draft is not consistent with the PAR associated with this project.
- Contents herein are submitted as a part of the comment submitted against 802.3ag D2.4.

PAR – from 802.3cg

2.1 Title: Standard for Ethernet Amendment: Physical Layer Specifications and Management Parameters for 10 Mb/s Operation ~~over Single Balanced Twisted pair Cabling and Associated Power Delivery~~ and **Associated Power Delivery over a Single Balanced Pair of Conductors.**

5.2.b. Changes in scope of the project: Specify additions to and appropriate modifications of IEEE Std 802.3 to add 10 Mb/s Physical Layer (PHY) specifications and management parameters for operation, and associated optional provision of power, ~~on using a single balanced twisted-pair copper of cabling~~ **conductors.**

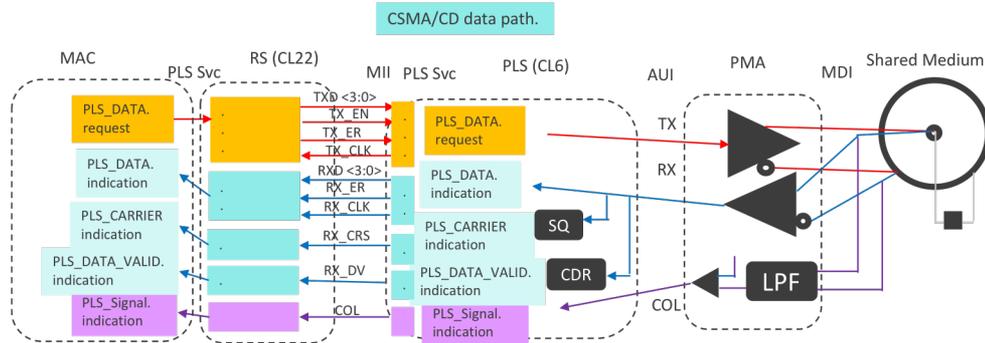


Project Scope

1. PLS or RS ↔ Medium
2. Power → Medium
3. Management

PAR issues w/ 802.3cg

1.4.425 Reconciliation Sublayer (RS): A mapping function that reconciles the signals at the Media Independent Interface (MII) to the Media Access Control (MAC)-Physical Signaling Sublayer (PLS) service definitions. (See IEEE Std 802.3, Clause 22.)



From Draft D2.4: **148. PLCA Reconciliation Sublayer (RS)** ” This clause specifies the optional Physical Layer Collision Avoidance (PLCA) capabilities.....

148.2 Overview .. The working principle of PLCA is that transmit opportunities on a mixing segment are granted in sequence based on a node ID unique to the local collision domain (set by the management entity). Other than the condition that the assigned node ID must be unique to the local collision domain, the method of determination of the node ID and to_timer by the management entity is beyond the scope of this standard.

Transmit opportunities are generated in a round-robin fashion. The node with ID = 0 signals a BEACON on the medium. Reception of a BEACON indicates the start of a new cycle of transmit opportunities.....

PLCA relies on the PLS_SIGNAL.indication and PLS_CARRIER.indication primitives to have the MAC delay transmission until a transmit opportunity is met.

PAR issue:

- RS is a mapping function that reconciles the signals. PLCA claims to be an RS, a mapping function, but provide medium access control function, yet it claims in comment resolution it is not a MAC (Medium Access Control).

PAR issues w/ 802.3cg – Reference Material from 802.3-2018

4.1 Functional model of the MAC method

4.1.1 Overview

.... The LLC sublayer and the MAC sublayer together are intended to have the same function as that described in the OSI model for the Data Link Layer alone. In a broadcast network, the notion of a data link between two network entities does not correspond directly to a distinct physical connection. Nevertheless, the partitioning of functions presented in this standard requires two main functions generally associated with a data link control procedure to be performed in the MAC sublayer. They are as follows:

- a) **Data encapsulation (transmit and receive)**
 - 1) **Framing (frame boundary delimitation, frame synchronization)**
 - 2) **Addressing (handling of source and destination addresses)**
 - 3) **Error detection (detection of physical medium transmission errors)**
- b) **Media Access Management**
 - 1) **Medium allocation (collision avoidance)**
 - 2) **Contention resolution (collision handling)**

.... 4.1.2 CSMA/CD operation

.... Transmit frame operations are independent from the receive frame operations. A transmitted frame addressed to the originating station will be received and passed to the MAC client at that station. This characteristic of the MAC sublayer may be implemented by functionality within the MAC sublayer or full duplex characteristics of portions of the lower layers.

No issues on these

Managed Objects

Describe the plan for developing a definition of managed objects. The plan shall specify one of the following:

- a) The definitions will be part of this project.
- b) The definitions will be part of a different project and provide the plan for that project or anticipated future project.
- c) The definitions will not be developed and explain why such definitions are not needed.

The definition of protocol independent managed objects will be part of this project.

In addition, it is expected that the protocol-specific definition of managed objects will be added in a future amendment to an IEEE 802.3 Standard for Management.

Coexistence

A WG proposing a wireless project shall demonstrate coexistence through the preparation of a Coexistence Assurance (CA) document unless it is not applicable.

- a) Will the WG create a CA document as part of the WG balloting process as described in Clause 13?
- b) If not, explain why the CA document is not applicable

- A CA document is not applicable because the proposed project is not a wireless project.

Broad Market Potential

& Technical Feasibility

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Broad Market Potential

Each proposed IEEE 802 LMSC standard shall have broad market potential. At a minimum, address the following areas:

- a) Broad sets of applicability.
- b) Multiple vendors and numerous users.

Broad Sets of Applications:

10 Mb/s single-pair Ethernet in the automotive market will enable replacement of multiple legacy protocols with Ethernet, taking advantage of lower cost and throughput requirements than 100 Mb/s automotive Ethernet, furthering consolidation of legacy in-car networks in a homogeneous architecture.

10 Mb/s single-pair Ethernet in the industrial market will enable replacement of multiple legacy protocols with Ethernet in a number of market segments in industrial automation, with greater applicability than 100BASE-T1 and lower system cost than 10BASE-T.

10 Mb/s single-pair Ethernet in the intra-system control market will enable replacement of multiple legacy protocols with Ethernet in a number of market segments including enterprise and data center networking and servers.

Multiple vendors and numerous users:

At the original Call for Interest, 79 individuals from 55 companies indicated they would support this project. These included companies from industrial automation, building automation, automotive, automotive OEMs, silicon, infrastructure, cabling, connector, and test equipment vendors.

At an additional Call for Interest held to add intra-system applications, 64 individuals from 43 companies indicated support. This included additional companies enterprise and data center networking and server vendors, and component suppliers to them.

Substantial Market Potential:

Data presented at the original CFI indicate a substantial market potential, e.g., the prediction for 2019 is 165 million total ports/year.

Data presented at the additional CFI indicate an addition of > 450 million ports/year.

No update and corrections needed to be assured of broad market potential on 10BASE-T1L.

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Technical Feasibility

Each proposed IEEE 802 LMSC standard shall provide evidence that the project is technically feasible within the time frame of the project. At a minimum, address the following items to demonstrate technical feasibility:

- a) Demonstrated system feasibility.
- b) Proven similar technology via testing, modeling, simulation, etc.
- c) Confidence in reliability.

The proposed project will build on the array of Ethernet component and system design experience, and the broad knowledge base of Ethernet network operation.

Ethernet over a single balanced pair of conductors has been proven both technically and operationally in deployments at rates from 2 Mb/s up to 2.5 Gb/s.

Single-pair power delivery has been proven technically feasible under IEEE P802.3bu. Implementation of single-pair powering for this project is feasible using a range of existing technologies.

Component vendors, including PHY vendors, cabling vendors and systems vendors have presented data on the feasibility of the necessary components for this project. Proposals which leverage existing technologies have been provided.

The reliability of Ethernet components and systems can be projected in the target environments with a high degree of confidence.

The project targets two PHYs with reaches of approximately 15 m and 1000 m, respectively.

No issues on these

Compatibility

Each proposed IEEE 802 LMSC standard should be in conformance with IEEE Std 802, IEEE 802.1AC, and IEEE 802.1Q. If any variances in conformance emerge, they shall be thoroughly disclosed and reviewed with IEEE 802.1 WG prior to submitting a PAR to the Sponsor.

- a) Will the proposed standard comply with IEEE Std 802, IEEE Std 802.1AC and IEEE Std 802.1Q?
- b) If the answer to a) is "no", supply the response from the IEEE 802.1 WG.
- c) Compatibility with IEEE Std 802.3
- d) Conformance with the IEEE Std 802.3 MAC
- e) Managed object definitions compatible with SNMP

As a PHY amendment to IEEE Std 802.3, the proposed project will remain in conformance with IEEE Std 802, IEEE Std 802.1AC, and IEEE Std 802.1Q.

As a PHY amendment to IEEE Std 802.3, the proposed project will use MII, and follow the existing format and structure of IEEE 802.3 protocol-independent specification of managed objects.

The proposed amendment will conform to the IEEE 802.3 MAC.

The project will include a protocol independent specification of managed objects. In addition, it is expected that the protocol-specific definition of managed objects will be added in a future amendment to an IEEE 802.3 Standard for Management.

Compatibility with 802.1D/Q and 802.1AC

- Cause: Frame reflected back from the medium is not its own in half-duplex operation and proposed CL128 PLCA.
- Impact: installed base of 10M and 100M MACs from most major Si suppliers from 1980's to 1990's

Compatibility with 802.3

- Cause: The proposed CL128 PLCA claims to be RS but behaves as a medium access control.
- Impact: Any number of new MAC could be implemented in RS in the future, and layering model is broken.

Compatibility with CL22 MII

- Cause: Claimed to use CL22 MII, and modifies its specification and adds additional PICS, caused by proposed the CL128 PLCA
- Impact: CL22 MII has been in use since 100 Mbps Ethernet and is an exposed interface that serves as a conformance test point. Due to compatibility concerns to numerous installed base, existing interfaces are not changed. It is also very possible to render existing conformant CL22 MII implementation in the field to be not conformant upon acceptance of these proposed changes in 802.3cg draft.

Compatibility

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Compatibility with 802.3 CSMA/CD

- Cause: Proposed CL148 PLCA supports packet bursting of 127 frames, configured by an individual node without regard to the rest of the network.
- Impact: A single station, either by intent or by configuration error, could deny fair access, and cause upper layer protocol time-outs (~150 mS), and effect other network services, such as digital audio transport or as precision time synchronization (802.1AS), etc.

Distinct Identity

This project is indeed distinct from other 802.3 project.

But this project is NOT distinct within its own project.

802.3cg defines Four PHYs.

1. 10BASE-T1L in CL146
2. 10BASE-T1S half-duplex over link segment – mandatory PHY
3. 10BASE-T1S half-duplex over shared medium – OPTIONAL “mode” of PHY
4. 10BASE-T1S full-duplex over link segment – OPTIONAL “mode” of PHY, all in CL147

PHY type 2 makes little sense when this project rejected support of CL9 repeaters, e.g. 10BASE-T repeaters (hubs) and is the mandatory PHY to conform to 802.3cg.

PHY type 3 does not interoperate with PHY type 4.

PHY type 3 is superset (working over shared medium covers operation over a link segment, and shared transmitter and channel spec) of the type 2, there fore type 2 should be deleted (superfluous PHY type with zero added application and use).

But when type 2 is deleted, then it become clear that 10BASE-T1S has two PHYs type 3 and type 4, which does not interoperate with each other.

Issue: Type 2 and type 3 are not distinct PHYs. And if fixed, then CL147 contain two non-interoperable PHYs.

Distinct Identity

Each proposed IEEE 802 LMSC standard shall provide evidence of a distinct identity. Identify standards and standards projects with similar scopes and for each one describe why the proposed project is substantially different.

Substantially different from other IEEE 802.3 specifications / solutions.

There is no IEEE 802.3 standard for an Ethernet PHY using a single balanced pair of conductors at a 10 Mb/s data rate.

The project may define multiple PHYs, but will define only a single PHY per maximum link segment distance.

The new proposed standard will define optional power delivery supporting the new 10 Mb/s single-pair operation and distances. In contrast, IEEE P802.3bu only defines power delivery with physical parameters compatible with 100BASE-T1, 1000BASE-T1, or without a data entity.

Each proposed IEEE 802 LMSC standard shall provide evidence of economic feasibility. Demonstrate, as far as can reasonably be estimated, the economic feasibility of the proposed project for its intended applications. Among the areas that may be addressed in the cost for performance analysis are the following:

- a) Balanced costs (infrastructure versus attached stations).
- b) Known cost factors.
- c) Consideration of installation costs.
- d) Consideration of operational costs (e.g., energy consumption).
- e) Other areas, as appropriate.

The 10 Mb/s single-pair Ethernet interface to be defined by this project will maintain a favorable cost balance for applications operating over a single balanced pair of conductors.

As a PHY project providing rate reduction over a single pair and extending the single pair Ethernet networking to longer-reach and lower-cost applications, there will be a balance of costs for infrastructure vs. attached stations.

The cost factors for Ethernet components and systems are well known. The proposed project may introduce new cost factors which can be quantified.

Prior experience in the development of the 100BASE-T1 and 1000BASE-T1 specifications for Ethernet indicates that the specifications developed by this project will entail a reasonable cost for the resulting performance.

The reduction in the number of legacy networks requiring specialized components, expertise, and gateways in the targeted markets is anticipated to result in a significant drop in both installation and operational costs.

Overall costs are anticipated to be minimized by introducing Ethernet network architecture, management, and software into the target environments.

Migrating intra-system control, automotive, and automation networking to Ethernet is anticipated to result in a significant improvement in system cost/performance.

Consideration of installation costs

- **Cause:** 10BASE-T1S CL147.8 shared medium MDI points, minimum of 8 MDIs, must meet the same insertion loss and return loss spec as the link segment in CL127.7.1, and CL127.7.2, any to any, without any other media design considerations. 10 cm stubs and terminations could be anywhere.
- **Impact:** This requirement necessitates installer (or automotive harness manufacturer) to perform 28, measurements among all combination of 8 MDI points, and grows as number of nodes (MDIs) increase. And a single added MDI may render other combinations MDI no longer conformant. All from the lack of medium design considerations.

Known cost factors

- **Cause:** Proposed CL148 PLCA requires every nodes' PLCA parameter to be configured and engineered to function. In addition, a single misconfigured node could render entire network segment in operable.
- **Concern:** This is a completely new behavior for Ethernet. Ethernet could be configured, engineered, and managed, but has offered plug-&-play operation with assured compatibility. The configuration and management needs that PLCA has is similar to that of CAN (Control Area Network) and other legacy buses. The known cost factors of historical Ethernet brand does not and cannot apply to the use of the CL148.

Thank You

