IEEE 802.3 Pin-Optimized PHY Interface Study Group Closing Report

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IEEE 802.3 Pin-Optimized PHY Interface Study Group
Study Group information

Study Group Organization

Jason Potterf, IEEE 802.3 Pin-Optimized PHY Interface Study Group Chair

Jon Lewis, IEEE 802.3 Pin-Optimized PHY Interface Study Group Secretary

Study Group charter

Move that the IEEE 802.3 Working Group request the formation of a Study Group to develop a Project Authorization Request (PAR) and Criteria for Standards Development (CSD) responses for an Ethernet Media Independent Interface (MII) optimized for an exposed interconnect.

Study Group web and reflector information

Reflector information: https://www.ieee802.org/3/POPI/reflector.html

Home page: https://www.ieee802.org/3/POPI/index.html

IEEE 802.3 Pin-Optimized PHY Interface Study Group Activities This Week

Study group met Wednesday PM1

- Received and responded to comments from 802.1 and 802.11
  - Comments helped the Study Group improve clarity of PAR and CSD responses
- Voted to move revised PAR and CSD responses forward

PAR and CSDs Available:

POPI PAR Responses with Working Group Review Changes – Clean
https://www.ieee802.org/3/POPI/public/2025-07-30/POPI_PAR_2025-07-30_wgreview_clean.pdf

POPI PAR Responses with Working Group Review Changes – Deltas
https://www.ieee802.org/3/POPI/public/2025-07-30/POPI_PAR_2025-07-30_wgreview_delta.pdf

POPI CSD Responses with Working Group Review Changes – Clean
https://www.ieee802.org/3/POPI/public/2025-07-30/POPI_CSD_2025-07-30_wgreview_clean.pdf

POPI CSD Responses with Working Group Review Changes – Deltas
https://www.ieee802.org/3/POPI/public/2025-07-30/POPI_CSD_2025-07-30_wgreview_delta.pdf

IEEE 802.3 Pin-Optimized PHY Interface Study Group
Next Steps

Move to Task Force

IEEE 802.3 Pin-Optimized PHY Interface Study Group
802.1 Comments and Responses

Document	Section	Comment	Response
PAR	Scope 5.2.b	Suggest removing “may” and reword to "Each interface supports… and a multiport PHY as applicable".	Accepted in principle. The word "may" was removed as the SG found the word was not actually needed.
CSD	Overall	Suggest using the latest template document for the CSD https://mentor.ieee.org/802-ec/dcn/18/ec-18-0064-02-0PNP-csd- template-in-doc-format.doc	The 802.3 operations manual mandates additions to the IEEE 802 CSD, but those additions do not appear in the IEEE 802 CSD doc file. We have requested that WG leadership consider moving to the Word doc format for future CSD submissions.
CSD	Page 7	Suggest rewording "and counts that" in the first sentence to "and counts than"	Accepted.
CSD	Page 8	End of Bullet point two “such as RMII, RGMII, SGMII, etc.”, etc. is superfluous in addition to “such as”, suggest removing “etc.”	Accepted.

IEEE 802.3 Pin-Optimized PHY Interface Study Group 802.11 Comments and Responses

Document	Section	Comment	Response
PAR	2.1	Suggest changing “a Pin” to “an”. The use of Pin in the Title, but it is not in the scope of the project. Pin should be used in both the Title and the Scope. Another alternative: The title could also incorporate “optimized for exposed interconnects.”	Accepted.
PAR	5.5	There is a list of PHYs: 10BASE-T1L, 10BASE-T1S, proposed 100BASE-T1L, proposed 10BASE-T1M. Each of the standards behind them should be listed in 8.1. This would give insight into 802.3 for the reader.	Accepted in principle. The list of PHYs was struck as the intent is for this project to work with a large number of PHYs.
CSD	Distinct Identity	The use of “8 pins” may be better redescribed in terms of “optimized exposed interconnects”, or interconnection points or electrical contacts.	Accepted in principle. The Study Group agreed to change the term "pins" to "signals."
CSD	Economic Feasibility	Expand the first use of Acronyms: RMII, RGMII, SGMII, GMII, or XAUI.	Accepted. Please note that XAUI as it appears in 802.3 is not a traditional acronym as the X expands to "10 gigabit."

IEEE 802.3 Pin-Optimized PHY Interface Study Group
WG Motion

Move that the IEEE 802.3 Working Group request the re-chartering of the Pin-Optimized PHY Interface Study Group.

Moved by Jason Potterf on behalf of the study group

(Technical ≥ 75%)

Rationale for extension request: Approval has been sought to forward the IEEE P802.3dq PAR to NesCom, which was developed by this Study Group. This request for extension is only to address any issues during the approval process for the IEEE P802.3dq PAR.

IEEE 802.3 Pin-Optimized PHY Interface Study Group
WG Motion

Move that the IEEE 802.3 Working Group approve the IEEE P802.3dq Pin-Optimized PHY Interface objectives, as per https://www.ieee802.org/3/POPI/POPI_DRAFT_Objectives_2025-06-18_v01.pdf.

M: Jason Potterf

S: Bob Voss

(Technical ≥ 75%)

IEEE 802.3 Pin-Optimized PHY Interface Study Group WG Motion

Move that the IEEE 802.3 Working Group approve the IEEE P802.3dq Pin-Optimized PHY Interface CSD "Managed Objects", "Coexistence", "Broad Market Potential", "Compatibility", "Distinct Identity", "Technical Feasibility", and "Economic Feasibility" responses, as per https://www.ieee802.org/3/POPI/public/2025-07-30/POPI_CSD_2025-07-30_wgreview_clean.pdf.

M: Jason Potterf

S: Bob Voss

(Technical ≥ 75%)

IEEE 802.3 Pin-Optimized PHY Interface Study Group
WG Motion

Move that the IEEE 802.3 Working Group approve the IEEE P802.3dq Pin-Optimized PHY Interface PAR, in https://www.ieee802.org/3/POPI/public/2025-07-30/POPI_PAR_2025-07-30_wgreview_clean.pdf

M: Jason Potterf

S: Bob Voss

(Technical ≥ 75%)

Questions?

Thank You!

Backup Slides

PAR AND CSD RESPONSES

IEEE 802.3 Major PAR form questions

The PAR form is completed on-line in though the myProject system. Many of the PAR question are proforma and are automatically complete by selecting a IEEE 802.3 amendment project. These items include Standards Committee and the Working Group officers. This slideset therefore provides the major items from the PAR form to assist in consensus building leading up to approving a completed draft PAR form.

All acronyms shall be spelled out at first use.

The following are the Major PAR responses for the IEEE P802.3**dq** draft PAR

To add a continuation slide: CTRL-M -> right click new slide -> Layout -> select 'Continued' layout

PAR item 2.1 – Project title

Project title: Standard for Ethernet Amendment:
Physical Layer Specifications and Management Parameters for an Optimized Interface Between a MAC and a PHY

Help text: The title of the base standard is uneditable. Please enter the amendment title in the text box. The title should be sufficiently unambigious, understandable by NesCom member not from the society that submitted the PAR. All acronyms shall be spelled out in the title.

PAR item 4.2 and 4.3 Project dates

4.2 Expected Date of submission of draft to the IEEE-SA for Initial Standards Association Ballot:

January 2028

Help text: Enter the date the draft standard is planned to be submitted to IEEE-SA for Initial Standards Association Ballot.

4.3 Projected Completion Date for Submittal to RevCom:

September 2028

Help text: Enter the date the draft standard is planned to be submitted to RevCom for processing (not to exceed four years from the date of PAR submission). **It is suggested to allow at least six months after Initial Standards Association Ballot for the ballot process.** Cutoff dates for submitting draft standards to RevCom can be found in the yearly calendar located: http://standards.ieee.org/about/sasb/meetings.html.

PAR item 5.1 – Project participation

5.1 Approximate number of people expected to be actively involved in the development of this project:

20

Help text: This includes Working Group members, additional non-voting participants.

PAR item 5.2A – Standard scope

5.2A Scope of the complete standard:

This standard defines Ethernet local area, access and metropolitan area networks. Ethernet is specified at selected speeds of operation; and uses a common media access control (MAC) specification and management information base (MIB). The Carrier Sense Multiple Access with Collision Detection (CSMA/CD) MAC protocol specifies shared medium (half duplex) operation, as well as full duplex operation. Speed specific Media Independent Interfaces (MIIs) provide an architectural and optional implementation interface to selected Physical Layer entities (PHY). The Physical Layer encodes frames for transmission and decodes received frames with the modulation specified for the speed of operation, transmission medium and supported link length. Other specified capabilities include: control and management protocols, and the provision of power over selected twisted pair PHY types.

Help text: If this Amendment will change the scope statement of the complete document (base + Amendment), it can be edited and should be explained in the Additional Explanatory Notes field at the end of the PAR form. If this Amendment will not change the scope statement of the complete document the pre-populated text should be left as is.

PAR item 5.2B – Project scope

5.2B Scope of the Project:

The scope of the project is the specification of additions and modifications to IEEE Std 802.3 to add one or more new interfaces between a MAC and a PHY optimized for exposed interconnects. Each interface supports connections between a single MAC and a single-port PHY or between multiple MACs and a multiport PHY.

Help text: State what the Amendment is changing or adding.

PAR item 5.3 – Project contingency

5.3 Is the completion of this standard contingent upon the completion of another standard (Yes or No)? If yes, please explain below:

No

5.3.1 If yes, please explain:

N/A

Help text: Your explanation should include how the standard is dependent upon the completion of another standard. Also, if applicable, why a PAR request is being submitted if the standard currently under development is not yet complete. The title and number of the standard which this project is contingent upon shall be included in the explanation.

PAR item 5.4 – Project purpose

5.4 Will the completed document (base + amendment) contain a purpose clause:

○ Yes ◉ No

Note: IEEE Std 802.3 does not contain a Purpose Clause.

PAR item 5.5 – Project need

5.5 Need for the Project:

The growing body of IEEE 802.3 electrical physical layer devices operating at speeds below 1 Gb/s has intensified the demand for a modern, optimized interface between MACs and PHYs. Many PHYs would see benefit in both single and multi-port implementations. Such an effort may afford reduced pin count and implementation complexity while enabling data for multiple ports on a single interface and support for features such as Physical Layer Collision Avoidance (PLCA) and integrated Station Management. Most importantly, it could provide a modern alternative interface for PHYs that would otherwise use various industry specifications not currently in IEEE Std 802.3.

The need for the project details the specific problem that the standard will resolve and the benefit that users will gain by the publication of the standard. The need statement should be brief, no longer than a few sentences.

PAR item 5.6 – Stakeholders

5.6 Stakeholders for the Standard:

Providers of systems and components (e.g., processors, controllers, stand-alone MACs, as well as Ethernet PHY chip and IP developers) for networked devices, vendors, system integrators, and end-users that benefit from further adoption of Ethernet.

The stakeholders (e.g., telecom, medical, environmental) for the standard consist of any parties that have an interest in or may be impacted by the development of the standard.

PAR item 7.1 – Similar scope

7.1 Are there other standards or projects with a similar scope? (Yes or No)?

No

If yes, please explain:

N/A

Help text: Identify any standard(s) or project(s) of similar scope(s), both within or outside of the IEEE, and explain the need for an additional standard in this area.

For any standard(s) or project(s) of similar scope(s) add ‘Project slide(s)’
To add: CTRL-M -> right click new slide -> Layout -> select ‘Project’ layout

PAR item 8.1 – Additional notes

Additional Explanatory Notes:

5.2B - The interface between the MAC and PHY is commonly known as the Media Independent Interface ("MII" or "xMII"). However, the common usage differs from the specific definition in IEEE Std 802.3 and may include other aspects such as the Reconciliation Sublayer, Extender Sublayers, and Station Management.

If there is any further information that may assist NesCom in recommending approval for this project, include this information here. The title of any documents referenced in the PAR should be listed here.

IEEE 802.3 Criteria for Standards Development (CSD)

The IEEE 802 Criteria for Standards Development (CSD) are defined in Clause 14 of the IEEE 802 LAN/MAN Standards Committee (LMSC) Operations Manual. The criteria include project process requirements ("Managed Objects") and 5 Criteria (5C) requirements. The 5C are supplemented by subclause 4.5 'Criteria for Standards Development' of the 'IEEE 802.3 Ethernet Working Group Operations Manual'.

The following are the CSD Responses in relation to the IEEE P802.3dq PAR

Items required by the IEEE 802 CSD are shown in Black text and supplementary items required by IEEE 802.3 are shown in **blue** text.

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, to be included in Clause 30 of IEEE Std 802.3, will be part of this project.

Coexistence

A WG proposing a wireless project shall prepare a Coexistence Assessment (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? (yes/no)

b) If not, explain why the CA document is not applicable.

- No. A CA document is not applicable because the proposed project is not a wireless project.

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:

This standard may simplify the connection of a broad array of Ethernet PHYs to any device that implements this standard in the future.

Multiple Vendors and Numerous Users:

At a call for interest, 37 individuals from 23 affiliations indicated they would support a pin optimized interface between a MAC and a PHY . The responding individuals include subject matter experts with experience in PHY, MCU, CPU, and Ethernet switching semiconductor design and manufacturing.

Substantial Market Potential:

Once complete, this standard could replace existing pin-intensive interfaces between the MAC and the PHY in the field for both single-pair and multi-pair wired Ethernet, which ships hundreds of millions of ports per year.

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 Standards Committee.

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

a) & b) As a Physical Layer 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.

c) As an amendment to IEEE Std 802.3, a new interface will be defined, including an updated reconciliation sublayer that maps the PLS service primitives to the new interface, as well as mapping the new interface to the PCS.

d) The proposed amendment will conform to the IEEE 802.3 MAC as defined in Clause 4 of IEEE Std 802.3-2022 as the PLS service primitives will not be altered.

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 supporting a single interface between multiple MACs and multiple PHYs of any type. Further, there is no IEEE 802.3 specified interface between a MAC and a PHY of any type specified to carry a single port using fewer than 8 signals.

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 functionality sought by this project already exists in industry specifications for much higher port speeds and counts than those considered for this project. Thus, similar technology has been demonstrated in shipping products for several years. Reliability has also been demonstrated in these similar products in the field as they are used in mission critical infrastructure networks daily.

Economic Feasibility

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

- This project is not expected to have a significant impact on the balance of cost factors, installation costs, nor the operational costs.
- The influence of costs factors such as package pins and interface speeds are well known in the industry as they relate to legacy IEEE 802.3 interfaces such as Media Independent Interface (MII), Gigabit Media Independent Interface (GMII), or 10 Gigabit Attachment Unit Interface (XAUI) as well as industry interfaces such as Reduced Media Independent Interface (RMII), Reduced Gigabit Media Independent Interface (RGMII), or Serial Gigabit Media Independent Interface (SGMII).
- The primary goal of this project is to ***significantly improve*** the relative cost factors of the interfaces currently specified in IEEE Std 802.3. For example, this could be achieved by reducing the number of pins required or by reducing the complexity of the signaling.
- Solution costs will be positively impacted by reduced interface complexity.

Backup Slides

DRAFT OBJECTIVES

Basic Objectives

1. Define a scalable logical framework that can support arbitrary port speeds and counts while retaining as many of the feature in our Feature Objectives as possible.
2. Define an electrical interface to provide connectivity to a **single** Ethernet port with 8 or fewer pins operating at line speeds up to 100 Mb/s.
3. Provide **single** port connectivity without a SerDes.
4. Define an electrical interface to provide connectivity to as many as 8 ports, each with speeds up to 100 Mb/s using 8 or fewer pins.
5. Provide eight-port connectivity with a SerDes not to exceed 2 Gbps.

Feature Objectives

1. Provide an optional in-band MDIO management interface.
2. Support Energy Efficient Ethernet (EEE).
3. Support half-duplex operation.
4. Support Clause 148 PLCA.
5. Support full-duplex operation.
6. Support auto-negotiation (e.g. Clause 28, Clause 98)

Compatibility Objectives

1. Specify a MAC interface that maintains compatibility with Clause 96 PHYs.
2. Specify a MAC interface that maintains compatibility with Clause 97 PHYs.
3. Specify a MAC interface that maintains compatibility with Clause 146 PHYs.
4. Specify a MAC interface that maintains compatibility with Clause 147 PHY including support for Clause 148 PLCA.
5. Do not preclude support for proposed 100BASE-T1L PHYs (P802.3dg).
6. Do not preclude the transmission of PTP timestamps across the interface using in-band data.
7. Do not modify the preamble, thus precluding features that rely on the preamble being passed intact by the MII.