802.3 10BPE SG/802.3cg 10SPE TF

Proposed Changes to 802.3cg 10SPE PAR & CSD
Responding to comments from 802.11 and James Gilb

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802.3cg PAR/CSD Proposed Changes Summary

- Intra system use case (802.3 10BPE SG)
  - Explicitly call out intra-system control applications
  - Many references to “twisted pair”
    - replace with “**single balanced pair of conductors**”
  - Many references to “balanced cabling”
    - delete where possible or replace with “**single balanced pair of conductors”** or “**single-pair Ethernet**”
- Changed text legend

Bold Normal Shadow	**10BPE SG – add Intra system**
Bold Italics	***802.3cg 10SPE TF - Multidrop/Duplex***
Bold Underline	**802.3cg 10SPE TF - Approved text clean ups**
Black ~~strikeout~~, underline	Changes due to comments

PAR Changes

P802.3cg PAR proposed changes

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

5.1 Approximate number of people expected to be actively involved in the development of this project: 50.

5.2.b. Scope of the project: ~~Specify additions to and appropriate modifications of IEEE Std. 802.3 to add~~ This amendment defines10 Mb/s Physical Layer (PHY) specifications and management parameters for operation, and associated optional provision of power, **using a single balanced pair of conductors.**

5.5 Need for the Project: Applications such as those used in automotive and automation industries have begun the transition of legacy networks to Ethernet. This has generated **an intra-system control** need for a 10 Mb/s solution which will operate over **a single balanced pair of conductors**. IEEE 802.3 does not currently support 10 Mb/s over a **single balanced pair of conductors**, and a reduction in the number of **pairs of conductors and interface components** required for 10 Mb/s Ethernet will provide a basis for an optimized solution in these applications.

5.6 Stakeholders for the Standard: End-users, vendors, system integrators, and providers of systems and components (e.g., sensors, actuators, instruments, controllers, network infrastructure, user interfaces, and servers) for **networks including enterprise and data center networking,** automotive, other transportation, industrial, and building automation.

CSD Changes

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.

UNCHANGED

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.

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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.

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.

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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.

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.

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) 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.

Thank You!

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Consensus

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