IEEE 802.3 Multi-Gig Automotive Ethernet PHY Study Group Closing Report

Steve Carlson

High Speed Design, Inc./Robert Bosch GmbH

Vancouver, BC, Canada

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IEEE 802.3 Multi-Gig Automotive Ethernet PHY Study Group information

Study Group Organization

Steve Carlson, Chair

George Zimmerman, Ad Hoc Chair

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 Multi-Gig Automotive Ethernet PHY

Study Group web and reflector information

Reflector information: http://www.ieee802.org/3/NGAUTO/reflector.html

Home page: http://ieee802.org/3/NGAUTO/index.html

IEEE 802.3 Multi-Gig Automotive Ethernet PHY Study Group

Activities this week

Joint session with P802.3cg 10 SPE Monday afternoon/Thursday morning

Heard presentations on possible common work areas

Met Wednesday to update PAR and CSD based on 802 comments

Heard presentation on glass optical fibre

Pre-submitted documents – completed PAR, CSD, and OBJ

PAR: https://mentor.ieee.org/802-ec/dcn/17/ec-17-0008-00-00EC-ieee-p802-3ch-draft-par.pdf

CSD: https://mentor.ieee.org/802-ec/dcn/17/ec-17-0009-00-00EC-ieee-p802-3ch-draft-csd.pdf

OBJ: http://ieee802.org/3/NGAUTO/adopted_objectives_3NGAUTO_0317.pdf

Summary of Study Group Motions

January SG 2017 meeting

Motion to adopt PAR text (pre-submitted) Y: 20 N: 0 A: 4

Motion to adopt CSD text (pre-submitted) Y: 24 N: 0 A: 5

Motion to adopt objectives 1-10 Y: 26 N: 0 A: 6

February SG 2017 meeting

Motion to modify objective 9 Y: 26 N: 0 A: 1

Motion to modify objective 5, add 11-13 Y: 25 N: 0 A: 2

Motion to adopt objective 14 Y: 26 N: 0 A: 1

March SG 2017 meeting

Motion to change PAR and CSD: Y: 26 N: 0 A: 1

Motion to reject PAR change: Y: 24 N: 0 A: 3

Adopted Objectives

1. Preserve the IEEE 802.3/Ethernet frame format at the MAC client service interface
2. Preserve minimum and maximum frame size of the current IEEE 802.3 standard
3. Support full duplex operation only
4. Define optional startup procedure which enables the time from power_on=FALSE to a state capable of transmitting and receiving valid data to be less than 100ms
5. Support data rates of 2.5 Gb/s, 5 Gb/s and 10 Gb/s at the MAC/PLS service interface.

Adopted Objectives

6. Support a BER better than or equal to 10^{-12} at the MAC/PLS service interface (or the frame loss ratio equivalent)
7. Support optional Auto-Negotiation
8. Support optional Energy Efficient Ethernet
9. Support operation in automotive environments (e.g., EMC, temperature)
10. Do not preclude meeting FCC and CISPR EMC requirements.

Adopted Objectives

11. Define the performance characteristics of an automotive link segment and an electrical PHY to support 2.5 Gb/s point-to-point operation over this link segment supporting up to four inline connectors for at least 15m on at least one type of automotive cabling (e.g., UTP, STQ, STP, SPP, Coax, or Twinax).

12. Define the performance characteristics of an automotive link segment and an electrical PHY to support 5 Gb/s point-to-point operation over this link segment supporting up to four inline connectors for at least 15m on at least one type of automotive cabling.

Adopted Objectives

13. Define the performance characteristics of an automotive link segment and an electrical PHY to support 10 Gb/s point-to-point operation over this link segment supporting up to four inline connectors for at least 15m on at least one type of automotive cabling.

14. Support optional Clause 104 power over data lines on appropriate media.

WG Motion

Move that the IEEE 802.3 Working Group approve the IEEE P802.3ch NGAUTO objectives, as per slides 5 to 8 of 0317_multi_gig_close_report.pdf

M: N. Wienckowski

S: G. Zimmerman

Y: N: A: (Technical ≥75%)

P802.3ch PAR (changes)

2.1 Title: Standard for Ethernet: Physical Layer Specifications and Management Parameters for greater than 1 Gb/s Automotive Ethernet.

5.2B Scope of the Project: Specify additions to and appropriate modifications of IEEE Std 802.3 to add greater than 1 Gb/s Physical Layer (PHY) specifications and management parameters for media and operating conditions for applications in the automotive environment.

5.5 Need for the Project: Applications in automotive industries have begun the transition of legacy automotive networks to Ethernet to support Advanced Driver Assist Systems. This has generated a need for data rates greater than 1 Gb/s in the automotive environment. IEEE Std 802.3 does not currently support rates greater than 1 Gb/s in the automotive environment.

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 automotive applications.

https://mentor.ieee.org/802-ec/dcn/17/ec-17-0008-03-00EC-ieee-p802-3ch-draft-par.pdf

P802.3ch PAR (changes)

2.1 Title: Standard for Ethernet: Physical Layer Specifications and Management Parameters for greater than 1 Gb/s Automotive Ethernet.

5.2B Scope of the Project: Specify additions to and appropriate modifications of IEEE Std 802.3 to add greater than 1 Gb/s Physical Layer (PHY) specifications and management parameters for media and operating conditions for applications in the ~~vehicular~~ automotive environment.

5.5 Need for the Project: Applications in ~~vehicular~~ automotive industries have begun the transition of legacy automotive networks to Ethernet to support Advanced Driver Assist Systems. This has generated a need for data rates greater than 1 ~~G/bs~~ Gb/s in the ~~vehicular~~ automotive environment. IEEE Std 802.3 does not currently support rates greater than 1 Gb/s in the ~~vehicular~~ automotive environment.

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 ~~vehicular~~ automotive applications.

All changes per comments from 802.11

WG Motion

Move that the IEEE 802.3 Working Group approve the IEEE P802.3ch NGAUTO PAR, in https://mentor.ieee.org/802-ec/dcn/17/ec-17-0008-03-00EC-ieee-p802-3ch-draft-par.pdf

M: H. Zinner

S: S. Carlson

Y: N: A: (Technical ≥75%)

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

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:

Higher than current automotive Ethernet rates ~~in the automotive market~~ will enable replacement of multiple proprietary protocols operating at rates greater than 1 Gb/s with Ethernet, furthering consolidation of legacy in-car networks in a homogeneous architecture.

Autonomous automobiles ~~vehicles~~ are driving the need for higher data rates due to increased performance required of cameras, sensors, etc.

Multiple vendors and numerous users:

At the Call for Interest, 85 individuals from 38 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.

Data presented at the CFI indicate a substantial market potential, e.g., the prediction for 2019 is 270 million total 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.

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.

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 that supports Ethernet at rates greater than 1 Gb/s for the requirements of ~~vehicular~~ automotive applications.

The project may define multiple PHYs, but will define only a single PHY for each rate, media, and link reach combination.

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.

Full-duplex operation over a balanced twisted pair and other media has been proven both technically and operationally in deployments at rates from 2 Mb/s and higher.

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.

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.

Ethernet interfaces in the target data rate range defined by this project will maintain a favorable cost-performance balance.

The balance of costs between infrastructure and attached stations is not applicable to the ~~vehicular~~ automotive environment.

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 other physical layer 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 will result in a significant drop in both installation and operational costs.

Overall costs are minimized by introducing Ethernet network architecture, management, and software into the ~~vehicular~~ automotive environment.

Migrating ~~vehicular~~ automotive networking to Ethernet results in a significant improvement in system price/performance.

WG Motion

Move that the IEEE 802.3 Working Group approve the IEEE P802.3ch NGAUTO CSD “Managed Objects”, “Coexistence”, “Broad Market Potential”, “Compatibility”, “Distinct Identity”, “Technical Feasibility”, and “Economic Feasibility” responses, as per 0317_multi_gig_close_report.pdf

M: N. Wienckowski

S: O. Grau

Y: N: A: (Technical ≥75%)

WG Motion

Move that the IEEE 802.3 Working Group request the re-chartering of the IEEE 802.3 Multi-Gig Automotive Ethernet PHY Study Group

M: S. Carlson on behalf of the Study Group

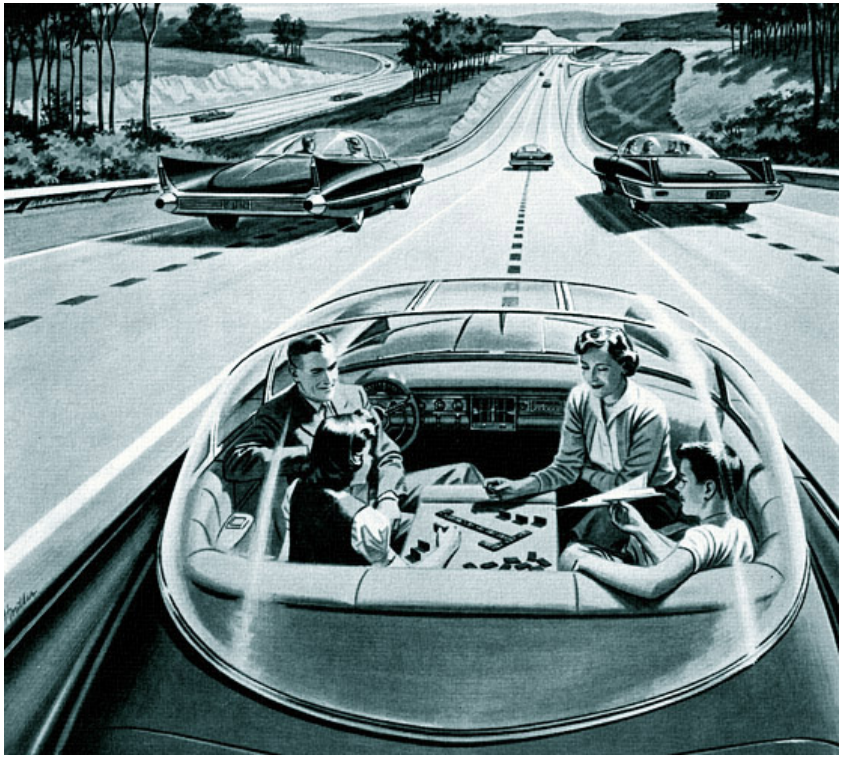
Y: N: A:

Procedural ≥ 50%)

Next Steps

- Continue ad hoc conference calls
  - Next call scheduled for April 5
- If PAR is approved, the Task Force to hold its first meeting at the 802.3 May Interim (New Orleans, LA, USA week of May 22)
- Else, will meet as a Study Group

Questions?



Thank you!