IEEE 802.3 Greater than 10 Gb/s Automotive Ethernet Electrical PHYs Study Group
PAR and CSD Comment Report

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IEEE 802.1 CSD Comments

CSD

Compatibility

While 802.1 is very supportive of this project, the standards defined by 802.1 have not focused on operation over asymmetric speed links.

We suggest to mention that the use of asymmetric links may require further study of the set of protocols defined in IEEE Std 802.1Q.

IEEE 802.1 PAR and CSD Comments

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**

REJECT

The CSD question is reproduced above. It requires conformance to IEEE 802.1AC and IEEE 802.1Q (and the IEEE 802.3 Std and MAC which is not an IEEE 802.1 standard.) It does not apply to "other" IEEE 802.1 standards.

For an observer above the MAC, a link with asymmetric data rates is indistinguishable from a symmetric link with asymmetric traffic flow. Our understanding is that the latter is something that has never been an issue for IEEE 802.1

IEEE 802.1 PAR and CSD Comments

CSD

Economic Feasibility

- *"The balance of costs between infrastructure and attached stations is not applicable to the automotive environment."*
- This statement is unclear to 802.1. Infrastructure includes bridges and routers, and we believe there are both infrastructure and attached stations within the automotive environment. Furthermore, we believe the balance of costs between these components of the solution is critical to the success of 802 technologies in the automotive environment.
- Please clarify your evaluation of the balance of costs.

IEEE 802.1 PAR and CSD Comments

CSD, Economic Feasibility, Balanced Costs

- **REJECT**

In subclause 14.2.5 'Economic Feasibility' of the IEEE 802 Operations Manual you will find that it reads 'Balanced costs (infrastructure versus attached stations)'. Subclause 3.1 'Definitions' of IEEE Std 802-2014 IEEE Standard for Local and Metropolitan Area Networks: Overview and Architecture defines 'station' as 'An end station or bridge. See also: bridge; end station.' and 'end station' as 'A functional unit in an IEEE 802® network that acts as a source of, and/or destination for, link layer data traffic carried on the network.'.

As a result the IEEE 802 Overview and Architecture defines both a bridge and a router (as a source and destination for link layer data traffic carried on the network) as a station. Since this criteria includes the text 'infrastructure versus attached stations', and since both a bridge and a router is a station, and therefore cannot be infrastructure, The statement 'Infrastructure includes bridges and routers ...' in the IEEE 802.1 comments is not correct.

We assert that neither infrastructure as defined nor your inclusion of bridges and routers into infrastructure apply to automotive networks because they are very different from enterprise networks and other network types where 802 technologies have traditionally been applied. An automotive network is precisely engineered from qualified subsystems (e.g., cable harness, electronic control units, etc.); and then replicated millions of times for installation in individual vehicles. Unlike an enterprise network, bridge and router functionality may not be a distinct device in an automotive network, e.g., it may be one function of a electronic control unit which may also include functions that might be considered a server in an enterprise network.

IEEE 802.11 PAR and CSD Comments

802.3CY AMENDMENT: GREATER THAN 10 GB/S AUTOMOTIVE ETHERNET ELECTRICAL PHYs, <u>PAR</u> and <u>CSD</u>

PAR 2.1 – The use of "Automotive Electrical Ethernet" was undefined. Should this just be "Automotive Ethernet"? Or should this be defined in the scope of the project.

5.2.b – add "architectures" after "zonal". Change "(centralized architecture)" to "(centralized)".

5.6 –"Tier 1 and below (top-level and below)" this seems to include all "automotive suppliers"..

Suggestions: 1. delete "(top-level and below)" or 2. change "automotive Original Equipment Manufacturers (car makers) and Tier 1 and below (top-level and below) automotive suppliers" to "automotive Original Equipment Manufacturers (car makers), automotive suppliers"

IEEE 802.11 PAR and CSD Comments

CSD: references to "Zonal (centralized) architecture" vs "(zonal or central architecture)" vs in the PAR "zonal (centralized architecture)"

The references should be consistent.

For PAR 5.6, after we provided the suggestions, we reviewed 802.3cz, and the description used in 5.6 and 8.1 seemed a better solution. Please consider using their text for 5.6 and 8.1.

IEEE 802.11 PAR and CSD Comments

PAR 2.1 Title

ACCEPT IN PRINCIPLE

"Automotive Ethernet" is an industry term (https://events.weka-fachmedien.de/automotive-ethernet-congress/home/), (https://standards.ieee.org/events/automotive/) and will be found in magazine and technical papers. We want to use the term, but need to differentiate between the electrical and optical projects.

P802.3cy: Physical Layer Specifications and Management Parameters for greater than 10 Gb/s Electrical Automotive Ethernet

P802.3cz: Physical Layer Specifications and Management Parameters for Multi-Gigabit Optical Automotive Ethernet

P802.3cy and P802.3cz have coordinated this joint response.

IEEE 802.11 PAR and CSD Comments

PAR 5.2b (should be **PAR 5.5**) **PAR 5.6** and CSD

ACCEPT IN PRINCIPLE

5.5 Need for the Project: Automotive in-vehicle networks have begun the transition from legacy electronic architectures (domain-based) to zonal architectures ~~(centralized architecture)~~ using Ethernet links to support fully autonomous operation. This has generated a need for data rates greater than 10 Gb/s in the automotive environment. IEEE Std 802.3 does not currently support rates greater than 10 Gb/s in the automotive environment.

5.6 Stakeholders for the Standard: End-users, automotive Original Equipment Manufacturers (car makers) and Tier x ~~1 and below (top-level and below)~~ automotive suppliers, system integrators, and providers of systems and components (e.g. 4K and 8K cameras, sensors, actuators, artificial intelligence (AI) processors, instruments, controllers, network infrastructure, user interfaces, and servers) for automotive applications.

The auto industry has settled on zonal as the preferred terminology. All references to centralized have been removed from the PAR and CSD.

IEEE 802.11 PAR and CSD Comments

Broad Sets of Applications:

Recent automotive electrical architecture changes, e.g. to zonal architectures, ~~(zonal or central architecture)~~ require automotive Ethernet rates in excess of 10 Gb/s.

Economic Feasibility

Zonal ~~(centralized)~~ architectures, enabled by greater than 10 Gb/s rates, will allow consolidation of processing resources similar to what has been seen in enterprise networks.

IEEE 802.11 PAR and CSD Comments

PAR 8.1

ACCEPT IN PRINCIPLE

8.1 Additional Explanatory Notes : For 5.5: "Domain-based" architectures have many separate Electronic Control Units (ECU) and networks for each automotive subsystem, e.g. powertrain, information and entertainment (infotainment), body (lights, windows, doors, etc.). "Zonal" architecture consolidates many of these cross-domain ECU functions into a small number of supercomputer-level ECUs networked with greater than 10 Gb/s Ethernet.

For 5.6 -- Tier x refers to the various levels of suppliers to Original Equipment Manufacturers (e.g., car manufacturer). A Tier 1 supplier for example supplies components or subsystems directly to the OEM.

IEEE 802 External PAR and CSD Comments

Move that the IEEE 802.3 Greater than 10 Gb/s Automotive Ethernet Electrical PHYs Study Group approve the responses to external 802 PAR and CSD comments in 0520_B10GAUTO_PAR_CSD_comment_report.pdf.

M:

S:

Y: N: A: (Technical ≥75%)

Questions?

Thank you!