Comments on PAR and Objectives for ISAAC

IEEE 802.3 ISAAC Study Group Interim Meeting

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Previously Discussed

- IEEE 802.3 ISAAC study group is working on PAR and Objectives for Imaging applications. Some text was previously presented.

- This presentation comments on previously discussed PAR and recommends additional Objectives.

Basic Objectives

- Preserve the IEEE 802.3/Ethernet frame format at the MAC client service interface
- Preserve minimum and maximum frame size of the current IEEE 802.3 standard
- Support operation in automotive environments (e.g., EMC, temperature)
- Do not preclude meeting FCC and CISPR EMC requirements
- Note: Based on the discussion via email reflector, we support not including Full Duplex operation objective.

Basic Objectives (cntd.)

- Do not preclude power delivery over the link segment

Note: Optimized power inductor size (cost and Ldi/dt) and power loss (adds heat to the camera) is highly desirable

- 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 100 ms

Note: written as less than 100 ms. This allows task force to specify a lower number if determined feasible.

- Define the performance characteristics of automotive link segments supporting up to two inline connectors for at least 12 meters on automotive coax and 10 meters on shielded balanced pair media and an electrical PHY to support up to at least **10 Gb/s** point-to-point operation in one direction and up to **100 Mb/s** point-to-point operation in the other direction over such link segments.

- Repeat for 5 Gb/s with 15 meters of Coax and 10 meters of STP
- Repeat for 2.5 Gb/s with 15 meters of Coax and 10 meters of STP
- Repeat for 1 Gb/s with 15 meters of Coax and 10 meters of STP

Note: repeated because technically speaking multiple PHYs are being specified

Note: 1 Gb/s because substantial number of lower resolution cameras ship. E.g. Typical 720p is below 1G

Additional Objectives to be considered

- Support a Bit Error Ratio better than or equal to 10^{-12} at the MAC/PLS service interface (or the frame loss ratio equivalent)

- Support optional auto-negotiation

Note: Useful not just for speed configuration, but also link configuration and link-up initialization

- Support for optional PHY level OAM

Note: example usage is local control signaling for downstream and upstream

- Support camera data transmission using clock recovered from remote side data

Note: this is common practice in the existing proprietary solutions for cost reduction and frequency synchronization of multiple cameras on the same hub

Additional Objectives to be considered (cntd.)

- Define a reconciliation sublayer to interconnect the Asymmetric PHYs to Annex 4A MAC

- Do not preclude remote Wake Up & Sleep capability

Note: Need very low power state whereby PHY is not linked up. Need a mechanism for power-down & power-up the module when the sensor is not in use.

- Latency objective?

Notes: we did a survey of several 802.3 recent projects to confirm that it is not customary to specify latency in the objectives. Recommend not including this objective unless someone makes a presentation to establish the need and provides suggestions for applicable parameters.

PAR Discussion

- Specify additions to and appropriate modifications of IEEE Std 802.3 to add:
  - Physical Layer specifications and management parameters for electrical media and operating conditions for applications in the automotive environment for operation up to 10 Gbps in one direction and up to Y Mbps in the other direction,

  and
  - A protocol or sublayer for interfacing a physical layer device with different data rate capabilities in the transmit and receive directions to the existing 802.3 MAC with media independent interfaces at existing 802.3 rates.

- Agree with downstream speed.
- For Camera applications, suggested "Y" = 100Mbps. More than that may be possible but for which applications?

Source: https://www.ieee802.org/3/ISAAC/public/082823/zimmerman_3ISAAC_01a_082923.pdf

Need and Stakeholders

- **Need –** Automotive in-vehicle *and IoT* networks have begun a transition to Ethernet. Multigigabit links such as imaging sensors at end-nodes of the network where the backchannel is low bandwidth are important parts of this transition. These end-nodes are highly constrained on complexity and power consumption and converting them to Ethernet will require solutions specified for their operating conditions. ~~IEEE Std 802.3 currently does not specify PHYs for the automotive environment specialized for traffic with such different throughput requirements in each direction.~~
- **Stakeholders –** End-users, automotive Original Equipment Manufacturers (car makers) and Tier x 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 *and IoT* applications.

- We should make it clear that the primary use case is automotive imaging.
- Any other application requires presentations on applicability, market size and if same objectives apply to them.
- Recommend removing IoT unless presentations are made to support this.

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Thank you!