Questions and responses to help move forward with PAR and objectives. (2)

IEEE 802.3

ISAAC Study Group

January 9, 2024

Kirsten Matheus, BMW Group

Motivation

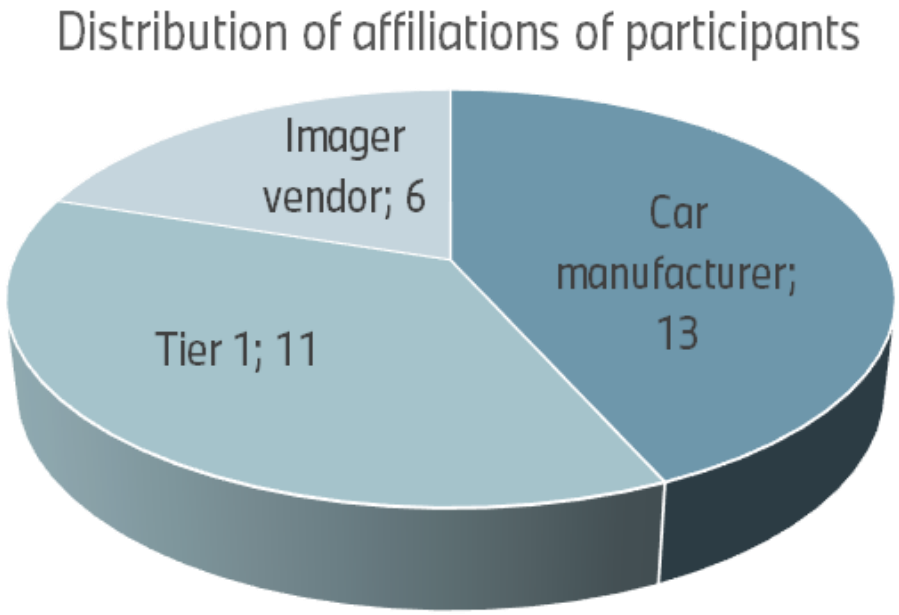
- In order to move to TF the ISAAC group has to complete PAR and objectives.
- This presentation the results of questions asked to experts in the industry.
  - Need for auto-negotiation
  - Need for energy saving mechanisms
  - Need for a 25Gbps/>10 Gbps PHY

Participants

Questions were sent to:

- 28 individuals working for one of 14 car manufacturers
- 16 individuals working with a focus on cameras and radars at one of 8 Tier 1s
- 12 individuals working at one of 5 Tier 2s that produce imager sensors

30 responses received



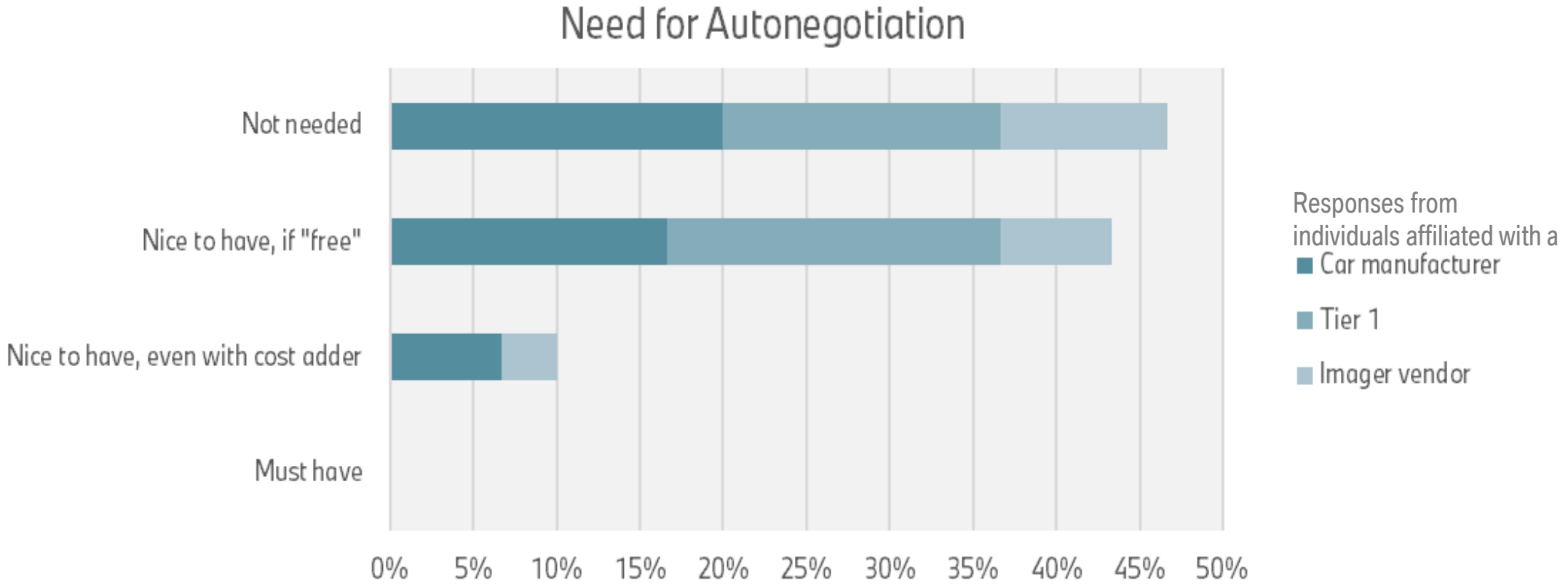
Disclaimer:
Gives an impression, but not statistically complete data.

Need for Autoneg (1)

How important is it, that the asymmetric camera/sensor technology supports auto-negotiation (i.e. a camera/sensor can be replaced by another with lower or higher capabilities without having to update any of the settings of the two units connected)? (pick one)

- **Must have**: Without autoneg capabilities, the technology would no longer be of interest to me, even if autoneg adds complexity and increases the relative costs of the PHY (>>1%).
- **Nice to have, even with cost adder**: It would be good to support (optionally), as I might use it, even if autoneg increases the relative costs of the PHY (>>1%).
- **Nice to have, if "free"**: It would be good to support, as I might use it, but only if it comes at no added relative costs (<<1%).
- **Not needed**: I do not expect to need autoneg. I expect a fully engineered network and that parameters are updated every time a unit is replaced with one with different capabilities.

Need for Autoneg (2)



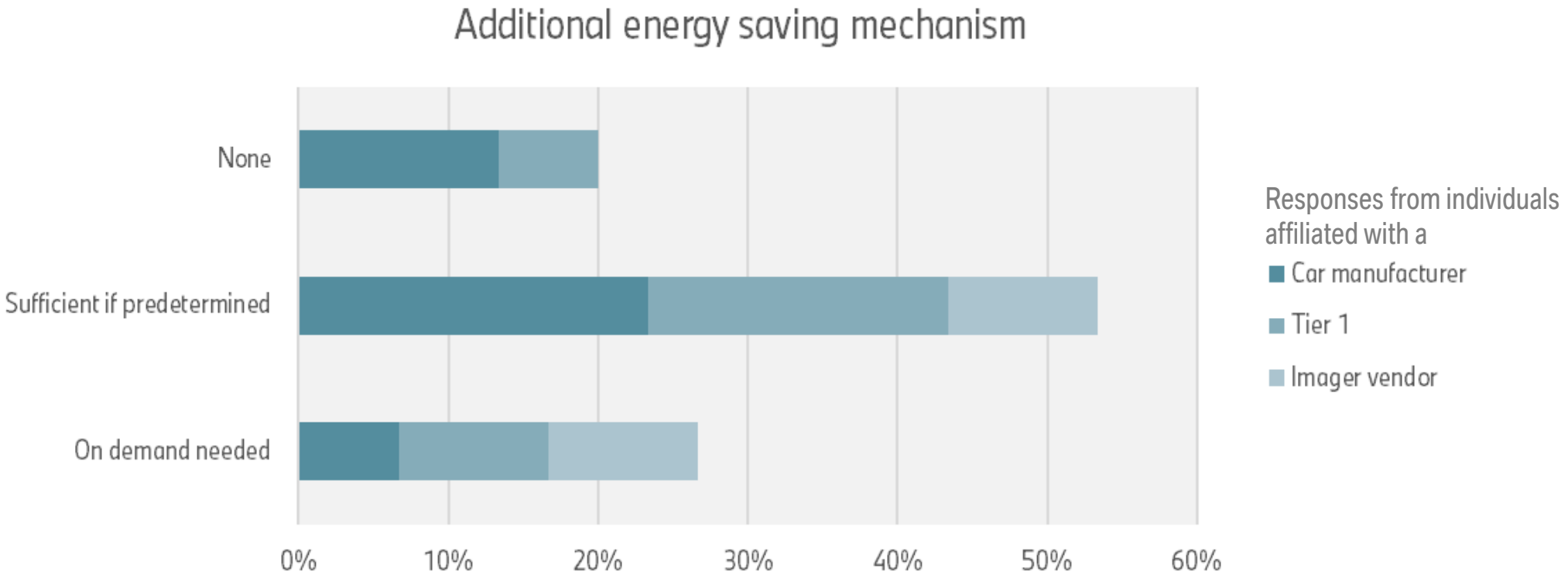
- No one sees auto-negotiation as a must have and very few participants would accept a noteworthy cost adder.
- The largest group (47%) sees it as not needed, even if it came for “free”.

Need for energy saving mechanisms (1)

It is understood that a competitive (low) power consumption of the solution being developed is important. Which of the following statements do you support in respect to energy saving mechanisms (pick one)

- "**On demand needed**": It is important that the solution supports an on-demand energy saving mechanism. I.e., it monitors the traffic on the channel and goes into energy saving when it perceives that no data is being sent and wakes up again when there is data to be transmitted. I know that such on demand process comes with a penalty of "transition times".
- "**Sufficient if predetermined**": It is sufficient for me if the solution supports an energy saving mechanism that considers the pre-determined nature of the traffic pattern of a sensor. For example, it is pre-emptively known that the max possible data rate is 5.5Gbps for the given sensor while the PHY is capable of 10Gbps. Hence, the link operates on a periodic basis.
- "**None**": I expect the solution to be power efficient as is and not to need additional power saving mechanisms (even if, e.g., only 5.5 Gbps video data are sent on a 10 Gbps link).

Need for energy saving mechanisms (2)



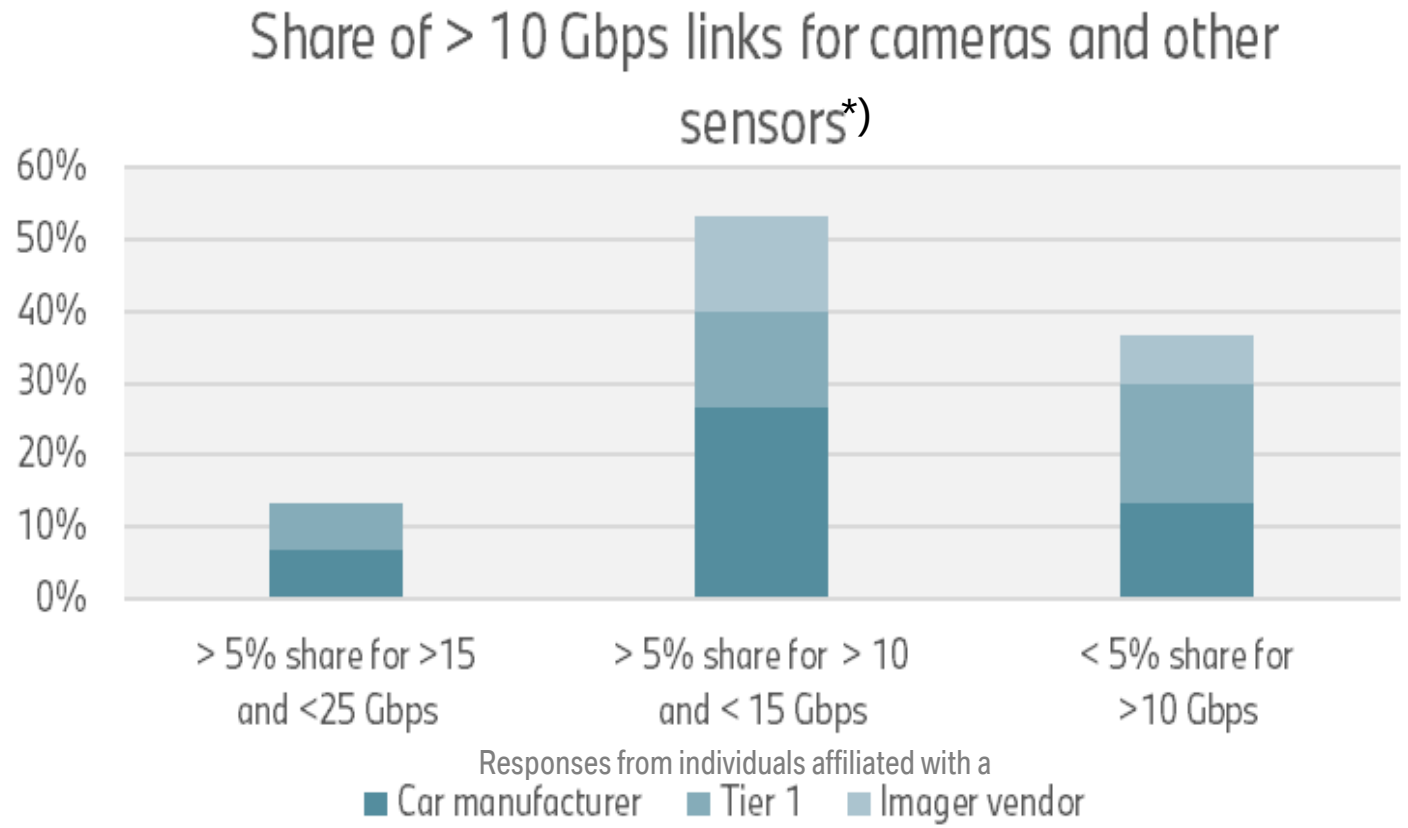
- 20% of the participants would not see an additional energy saving mechanism added (of which 2/3 are with OEM, 1/3 are with Tier 1 affiliation).
- 80% (which comprises 100% of those affiliated with an imager vendor) want an additional energy saving mechanism.
- Recommendation: Add an objective that captures the need for a respective mechanism.

Need for > 10 Gbps (1)

The new IEEE project already decided to support PHYs with 2.5, 5, and 10Gbps in the high-speed direction and 100Mbps in the low-speed direction. Concerning a potential 25Gbps/100Mbps solution, please indicate, which of the following statements concerning the market expectation you agree with? (Choose as many answers as you concur with, but please be consistent)

- I think that more than 10% of all automotive camera and sensor links in 2033 will require a 25 Gbps communication link
- I think that more than 5% of all automotive camera and sensor links in 2033 will require a 25 Gbps communication link
- I think that more than 1% of all automotive camera and sensor links in 2033 will require a 25 Gbps communication link
- I think that more than 10% of all automotive camera and sensor links in 2033 will require more than 10 Gbps communication link (but less than 15Gbps)
- I think that more than 5% of all automotive camera and sensor links in 2033 will require more than 10 Gbps communication link (but less than 15Gbps)
- I think that more than 1% of all automotive camera and sensor links in 2033 will require more than 10 Gbps communication link (but less than 15Gbps)
- None of the above (“<1% > 10 Gbps”)

Need for > 10 Gbps (2)



- Car manufacturers are somewhat more optimistic concerning the need for higher data rates than Tier 1s and imager vendors (37% → 41% with <5% share for > 10 Gbps, not depicted)
- Supporting 25 Gbps is not efficient if <15 Gbps is seen as needed.

*) Sum is > 100% because some participants see a significant share for >10 (but <15) and > 15 (but < 25) Gbps

Comparison between different speeds

	1 Gbps/ 100 Mbps*)	2.5, 5, 10 Gbps/ 100 Mbps	15 Gbps/ 100 Mbps	25 Gbps/ 100 Mbps
Broad market potential	Large market today, ~1/3 of the market expected in 2033	Majority of market in 2033	Some market expected in 2033, satisfies outlook	Small market expected in 2033
Support of a 15m, 4 inliner channel and/with coax	15m, 4 inliner and coax possible	15m, 4 inliner and coax possible	Tbc. impairments expected	Very unlikely
Low complexity PHY	Materially less complex than 2.5 Gbps possible	Baseline	More complex than 10 Gbps	Significantly more complex than 10 Gbps
Technical feasibility of xMII interface	GMII	XGMII	15Gbps MAC rate currently not supp.	25GMII
Existing “symmetric” PHYs	1000BASE-T1	2.5, 5, 10GBASE-T1	25GBASE-T1?	25GBASE-T1

*) see also: https://www.ieee802.org/3/ISAAC/public/1123/matheus_ISAAC_01_14112023.pdf
https://www.ieee802.org/3/ISAAC/public/010924/matheus_ISAAC_01_01092024.pdf

Solution space for 15 Gbps

If there is to be a PHY > 10 Gbps, 15 Gbps is a better choice than 25 Gbps. However, there is no MAC rate supporting 15 Gbps and a new MAC rate is not part of the original project.

Options:

a) Limit the PAR to 10 Gbps. Address 15 Gbps (and higher if desired) in a new project with a respective CFI/scope that allows to add a new MAC rate and so that > 10 Gbps does not slow this project.

b) Limit the PAR to 15 Gbps (and initiate whatever needs to be done, e.g. a CFI, to add a “15XMII” in parallel to the TF). This means NO 25 Gbps PHY.

c) Limit the PAR to 25 Gbps.

d) Make the PAR open (but no > 10 Gbps objective) and continue all > 10 Gbps discussions in the TF.

Summary and conclusion

This presentation gives an impression of opinions in the auto-industry on different technical aspects impacting PAR and objectives of ISAAC.

- No one sees auto-negotiation as a must have and only few participants find it nice to have optionally with a noteworthy cost adder.
- As more than ¾ of the participants see adding an additional energy saving mechanism as important, it is recommended to add a respective objective.
- 37% of the participants do not see a > 5% market for > 10 Gbps asymmetric links in 2033. 53% see it for up to 15 Gbps, 13% for up to 25 Gbps.*)
- However, a respective 15GMII is not (yet) defined at IEEE. Handling options need to be discussed. This could also happen in a subsequent project.
- In comparison, a 1 Gbps/100 Mbps PHY easily meets the CSD requirements and has a respective GMII interface available.

*) Sum is > 100% because some participants see a significant share for >10 (but <15) and > 15 (but < 25) Gbps

Straw Poll 1

- I would support an objective asking for “Support of an optional energy saving mechanism” that exploits situations in which less data is sent than the capacity of the PHY allows for.

- Yes
- No
- Abstain

Straw Poll 2

- I would support objectives for a 1 Gbps/100 Mbps PHY (over a 15m 4 inline connector link segment).

“Define an electrical PHY to support up to 1 Gbps data rate point-to-point operation in one direction and up to 100 Mbps point-to-point operation in the other direction over the defined balanced-pair link segment”.

“Define an electrical PHY to support up to 1 Gbps data rate point-to-point operation in one direction and up to 100 Mbps point-to-point operation in the other direction over the defined unbalanced coaxial link segment”.

- Yes
- No
- Abstain

Straw Poll 3

- Of the following options concerning the PAR, I would support the following (see page 11, select as many as you like):

a) Limit the PAR to 10 Gbps.
b) Limit the PAR to 15 Gbps.
c) Limit the PAR to 25 Gbps.
d) Make the PAR open (“higher in one direction, lower in the other”).
e) Abstain

Straw Poll 4

- I would support a CFI asking for a project to add a 15GMII MAC rate (and, if not done in this project, a respective 15 Gbps asymmetric PHY).

- Yes
- No
- Abstain

Thank You!