NGAUTO - Objectives

Uses Cases + speedgrades / link length / EMC

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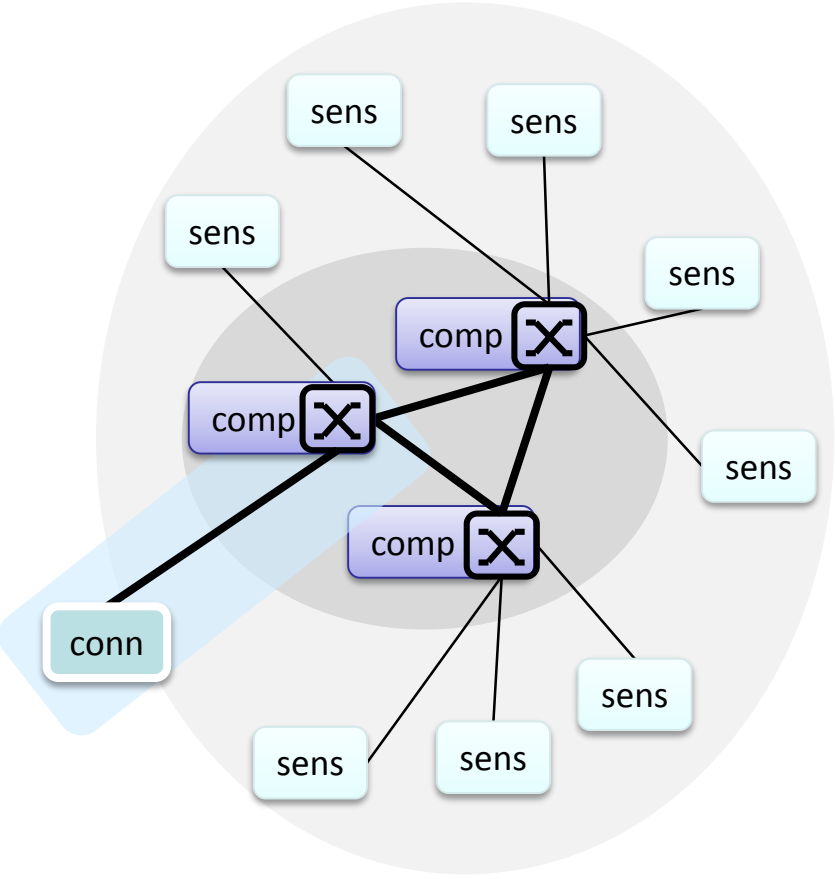
- Thomas Müller / Rosenberger

motivation

- This slide set provides a summary of the topics which need to be discussed in more detail to find consensus on the objectives for NGAUTO to proceed to task force phase.

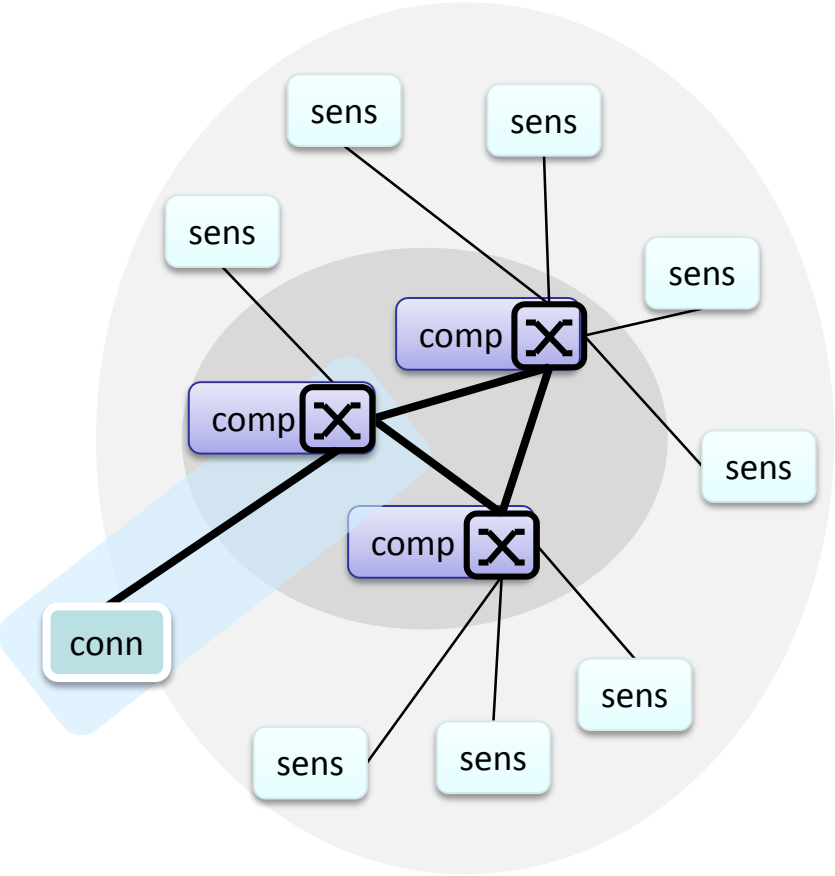
- Further technical inputs on these issues are provided as well by others
  - Kirsten Matheus (focus on channel and cabling options) (http://www.ieee802.org/3/NGAUTO/public/adhoc/matheus_NGAUTO_01_0201.pdf)
  - Olaf Grau (speedgrades, power consumption…) (http://www.ieee802.org/3/NGAUTO/public/adhoc/grau_NGAUTO_01a_0217.pdf)
  - Helge Zinner (Use Cases, …) (http://www.ieee802.org/3/NGAUTO/public/adhoc/zinner_NGAUTO_01a_0217.pdf)

Use Cases – overview autonomous driving



- (core) network (distributed computing)
  - very high bandwidth requirement
  - symmetric bandwidth needs
- sensor network
  - power constraints (e.g. camera)
  - asymmetric bandwidth needs
- connectivity (one link)
  - Backend connectivity (LTE/5G)
  - high bandwidth requirement
  - symmetric bandwidth needs

Use Cases – speed grades



- (core) network (distributed computing)
  - 10Gbps potentially needed
  - complex (costly) cable probably accepted
- sensor network
  - Sensor needs vary from 10M to 10G
  - 5/2,5Gbps for many applications sufficient
  - asymmetric solutions to lower power
- connectivity (one link)
  - probably 5/2,5Gbps symmetric are sufficient

Proposal: adopt objectives to allow for further speed grades below 10Gbps and as well asymmetric data rate solutions (*or uni-directional EEE?*).

Link Length

- link length in domain structure is potentially longer as in zone structure.
- Today‘s driver assistant systems (domain structure) have links with >10m.
- The switch from domain structure to zone structure will take long time.
  - Potentially SOP of vehicles with NGAUTO technology will still see domain structure solutions for E/E

- Shielded cabling (coax or STP) will potentially provide margin to stay at 15m.
- Reduced data rates (5Gbps/2,5Gbps) and potential asymmetric bandwidth will also provide margin to stay with 15m

Proposal: adopt objectives for 15m link length.

EMC – available cabling options

- Today available automotive cabling which provides shielding:
  - Shielded Twisted Quad Cable (differential, balanced and well shielded) http://www.rosenberger.de/de/products/automotive/hsd.php?top=6
  - Coax Cable (single-ended and well shielded) http://www.rosenberger.de/de/products/automotive/fakra.php?top=6
  - Unshielded Twisted Pair cabling with option for simple shielding (differential and unshielded or differential and “slightly” shielded) http://www.te.com/usa-en/products/connectors/automotive-connectors/intersection/matenet.html
    (The mentioned shielding option does provide a limited system shielding efficiency in terms of bandwidth and level)
  - Potentially others (STP, SPP, Twinax, …) options can be added as well

→ See also slides from Kirsten Matheus

EMC – available cabling options

- Proper shielding needs to be done on system level (e.g. sensor/camera systems in plastic housing cannot be shielded completely)
  - Shielding efficiency cannot be defined in cable-level only
  - **Inputs on shielding efficiency to the group are needed (cable, connector vendors?)**

- Today available cabling options allow for solutions with scalable shielding efficiency on system level

→ **Shielding efficiency and PHY design (EMC robustness) must be matched in Taskforce Phase to find optimum solution**

Proposal: adopt objectives to allow for various cabling options (UTP/STP/STQ/SPP/coax/…) and investigate in Taskforce Phase.

Conclusion

- Bandwidth scalability will provide broad marked potential. IEEE Working Group will probably not accept Taskforce, if broad market potential is not guaranteed. Together with asymmetric bandwidth power consumption can be reduce to acceptable level to use in cameras

  Proposal: adopt objectives to allow for further speed grades below 10Gbps and as well asymmetric data rate solutions.

- 10m link length will limit domain structure applications

  Proposal: adopt objectives for 15m link length

- Today available cabling options allow for solutions with scalable shielding efficiency on system level (shielding efficiency and PHY design must be matched in Taskforce Phase to find optimum solution)

  Proposal: adopt objectives to allow for various cabling options (UTP/STP/STQ/SPP/coax/…) and investigate in Taskforce Phase

Proposed change of already accepted objectives

1. Support operation ~~at 10Gbps~~ in automotive environments (e.g., EMC, temperature) ~~over single pair shielded balanced copper cabling.~~

2. Support ~~a~~ data rates of 10 Gb/s, 5 Gb/s and 2.5Gb/s at the MAC/PLS service interface.

Proposed new objectives

3. Define the performance characteristics of an automotive link segment and a PHY to support 2.5 Gb/s point -to-point operation over this link segment supporting up to four inline connectors and up to at least 15m on at least one type of automotive cabling (e.g. UTP, STQ, STP, SPP, Coax or Twinax).
4. Define the performance characteristics of an automotive link segment and a PHY to support 5 Gb/s point -to-point operation over this link segment supporting up to four inline connectors and up to at least 15m on at least one type of automotive cabling (e.g. UTP, STQ, STP, SPP, Coax or Twinax).
5. Define the performance characteristics of an automotive link segment and a PHY to support 10 Gb/s point -to-point operation over this link segment supporting up to four inline connectors and up to at least 15m on at least one type of shielded automotive cabling (e.g. STQ, STP, SPP, Coax or Twinax).