NGAUTO - Objectives

Uses Cases + speedgrades / link length / EMC

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supporters

- Seeking for supporters for interim meeting on Feb 21./22. …

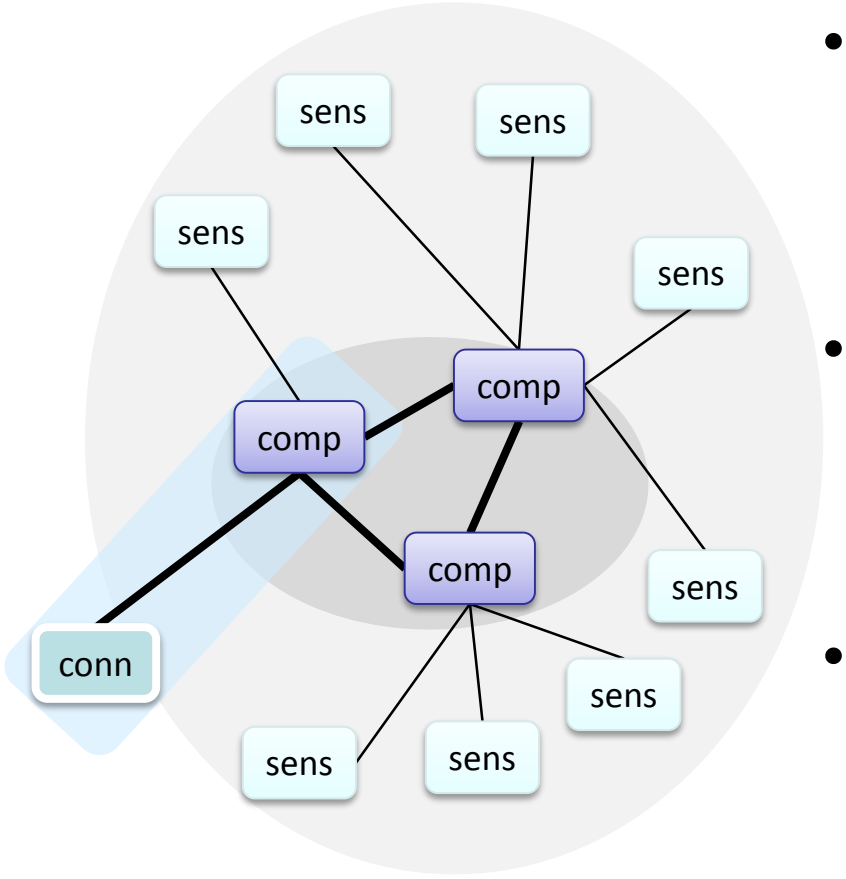
motivation

- This slide set provides a summary of the topics which should be discussed in more detail to find consensus on the objectives for NGAUTO to proceed to study group (discussion until Feb. Interim in Warren/MI)

- Further technical inputs on these issues will be provided as well by others
  - Kirsten Matheus (focus on channel and cabling options)
  - Olaf Grau (speedgrades, power consumption…)
  - Helge Zinner (Use Cases, …)

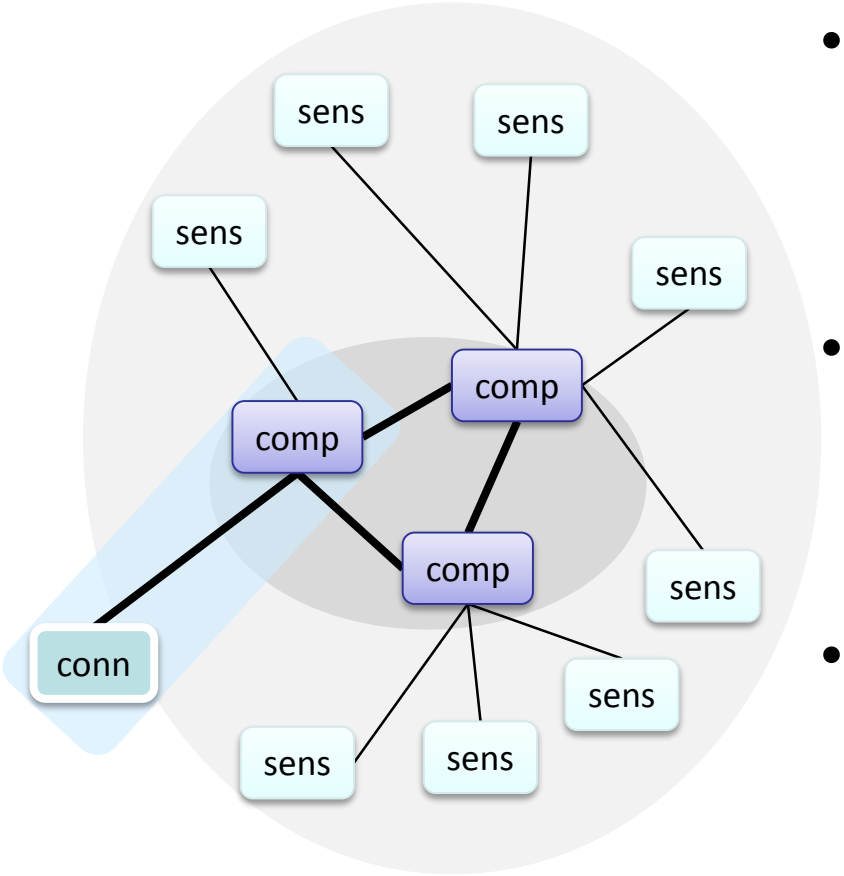
- The shown slides can be adopted to achieve broad consensus and then be shown again in the Feb. interim meeting (via WebEx)

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
  - 5/2,5Gbps for most 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 bandwidth solutions (*or automatic 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.
(*potentially 2 inliners are sufficient, number of inliners: TBD*)

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, Twinax) option 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 bandwidth 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 changes of the objectives as they are now

Now

- 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 full duplex operation only.
- 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.
- Support a BER better than or equal to 10-12 at the MAC/PLS service interface.
- Support a data rate of 10 Gb/s at the MAC/PLS service interface
- Support optional Auto-Negotiation
- Support optional Energy Efficient Ethernet
- Support operation at 10Gb/s in automotive environments (e.g., EMC, temperature) over single pair shielded balanced copper cabling.
- Do not preclude meeting FCC and CISPR EMC requirements.

Proposed

- 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 full duplex operation only~~ (delete objective)
- 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.
- Support a BER better than or equal to 10-12 at the MAC/PLS service interface.
- Support data rates of 10 Gb/s , *5Gb/s(?)* and 2,5Gb/s at the MAC/PLS service interface.
- Support 10Gbps operation over a 15m link segment with *4(2?)* inliners based on shielded automotive cabling (e.g. STQ, STP, SPP, Coax, Twinax).
- Support <10Gbps operation over a 15m link segment with *4(2?)* inliners based on efficient automotive cabling (e.g. UTP, STQ, STP, SPP, Coax, Twinax).
- Support optional Auto-Negotiation
- Support optional Energy Efficient Ethernet
- Support operation ~~at 10Gbps~~ in automotive environments (e.g., EMC, temperature) ~~over single pair shielded balanced copper cabling.~~ *(see mail from Georg Zimmermann)*
- Do not preclude meeting FCC and CISPR EMC requirements.