First considerations for 10Mbps@15m multidrop

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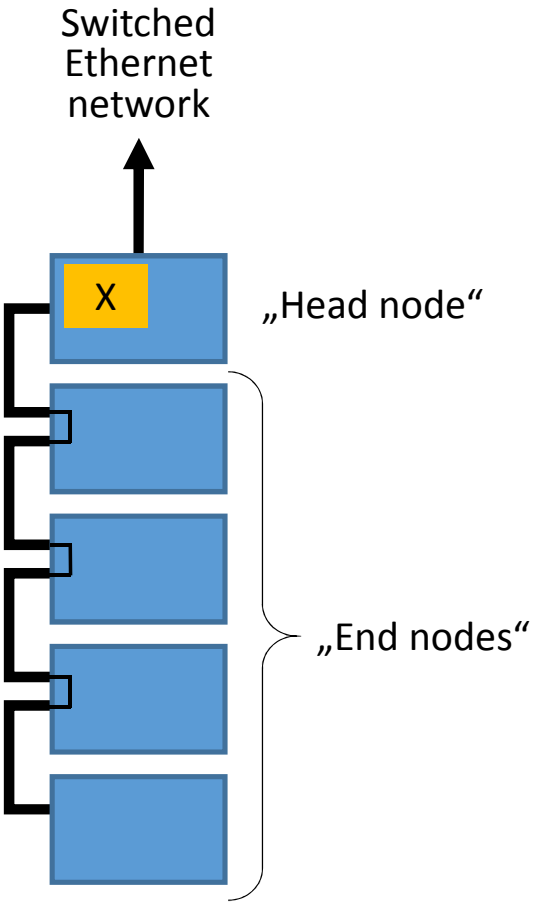
Problem description

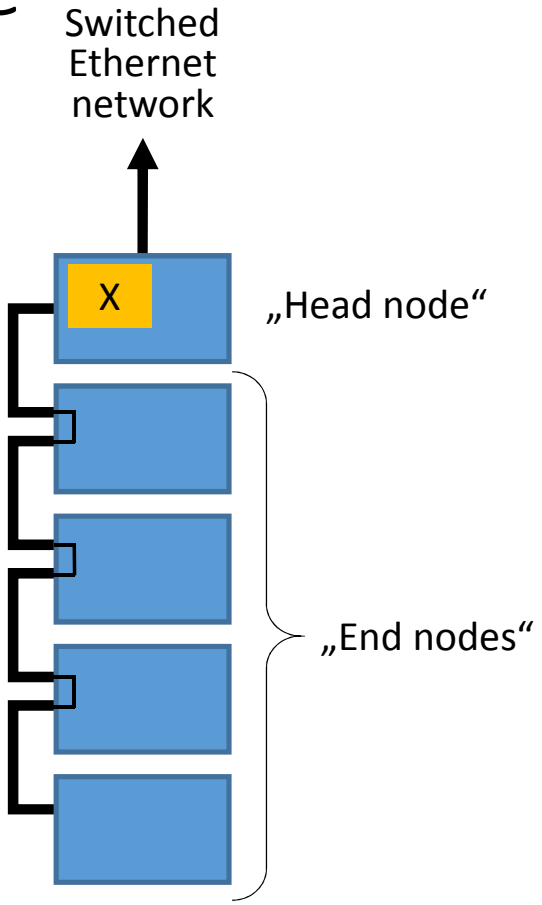
- If 10SPE@15m supports a bus structure (“multidrop”) the channel access has to be organized differently than in the switched network
- Existing IEEE 802.3 access schemes are:
  - CSMA -> outdated
  - P2MP in EFM -> suitable?
  - P2MP in copper EPON (EPoC) -> suitable?

  Same basic principles
- The question thus is whether reuse is possible for 10SPE@15m (the development of a new multiple access scheme means significant effort)



BMW requirements on bus structure

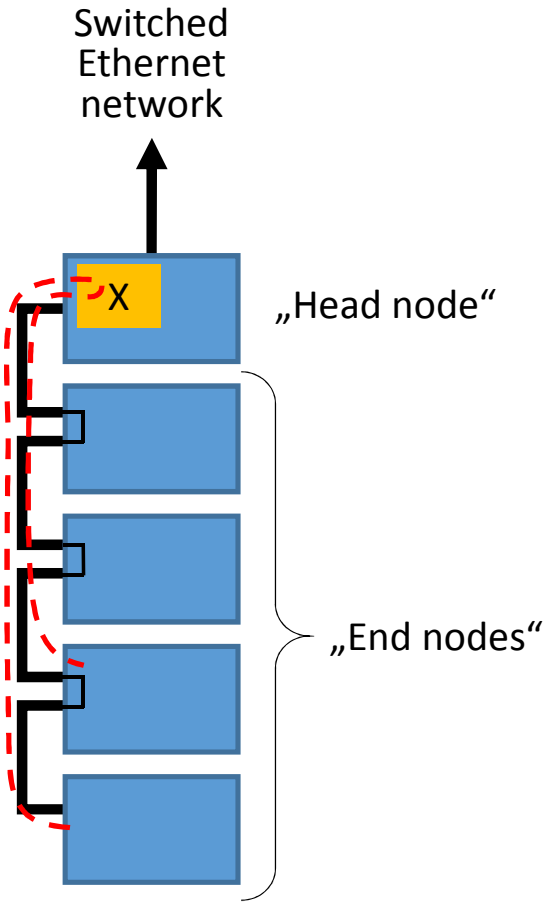
- No stubs (requires untwist for jointer)
- Daisy chain concept (see figure to the right, can be solved on the PCB, within the connector, within the crimp (i.e. the right connector concept))
- @BMW, CAN has 16 participants, CAN-FD currently 7 (expected to grow in the future) => 8 participants max. for 10SPE@bus
- Single data rate for “up” and “downlink”



Suitability of EFM/EPoC (1)

Current expectations based on Marek Hajduczenia's presentation in the 10SPE adhoc on Nov 30, 2016:

1. The desired daisy chain topology can be supported. However, the communication always passes via the head node, even if two end nodes want to communicate (see figure to the right). This is possible but uses additional bandwidth on the bus.
2. In principle, the same PHYs can be used in P2P as in multidrop scenarios. The changes needed happen on the data link layer, i.e. either in the bridge of the head node or in the processor the PHY is connected to in the end node.
   - Tbd: Does the addition of a multidrop channel increase the effort in a PHY in comparison to a P2P channel only? Can the effect of a "chain node" be compared with the effect of an inline connector? 8 participants ~ 6 inliners?

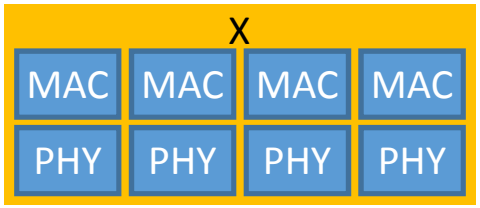


Suitability of EFM/EPoC (2)

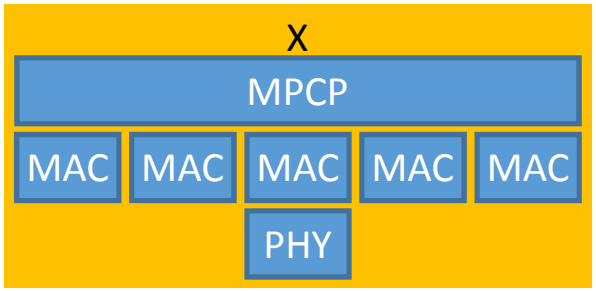
Current expectations based on Marek Hajduczenia's presentation in the 10SPE adhoc on Nov 30 2016:

3. In the end node MAC there is some additional effort for the address mapping and bandwidth reservation/allocation.
   - ➢ Tbd: Reasonable effort?
4. In the head node there is significant additional effort, with more complexity for address mapping, bandwidth reservation, one MAC per end node plus one for the downlink etc. In the original scenarios for EFM/EPoC, this effort was not crucial, in the 10SPE@bus scenario it might be.
   - ➢ Tbd: Reasonable effort? What is the comparison to having a switch with multiple MACs in the P2P scenario (see figure to the right)?

Simplified head node switch for **switched Ethernet network** with 4 end nodes



Simplified head node switch for **bus Ethernet network** with 4 end nodes



Conclusion

- In principle the EFM/EPoC multidrop scheme seems usable for the 10SPE@15m scenario.
- A bus topology should be possible with the same PHY (and the same cables, connector might vary depending on chaining concept) as the P2P topology
- Input needed on
  - Expected impact of daisy chain channel on PHY effort
  - Additional effort in MAC especially in head node MAC (also in comparison to switched scenario)
- Additionally, it needs to be investigated how aspects like discovery process, bandwidth allocation, VLAN, TSN etc. integrate into the overall Ethernet network.