

# AUTOSAR™

10BASE-T1S in AUTOSAR

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Ethernet & IP @ Automotive – Virtual Event

14 Sept 2020    IEEE SA

BMW  
GROUP



**BOSCH**

**Continental**

DAIMLER



PSA  
GROUPE

**TOYOTA**

VOLKSWAGEN  
AKTIENGESELLSCHAFT

# Agenda

- > 10BASE-T1S what is new ?
- > AUTOSAR overview
- > AUTOSAR solution for 10BASE-T1S
  - > Impact
  - > Solution approach
- > Summary

# Situation today

\* IVC: In-Vehicle Communication

## Diverse technologies co-existing

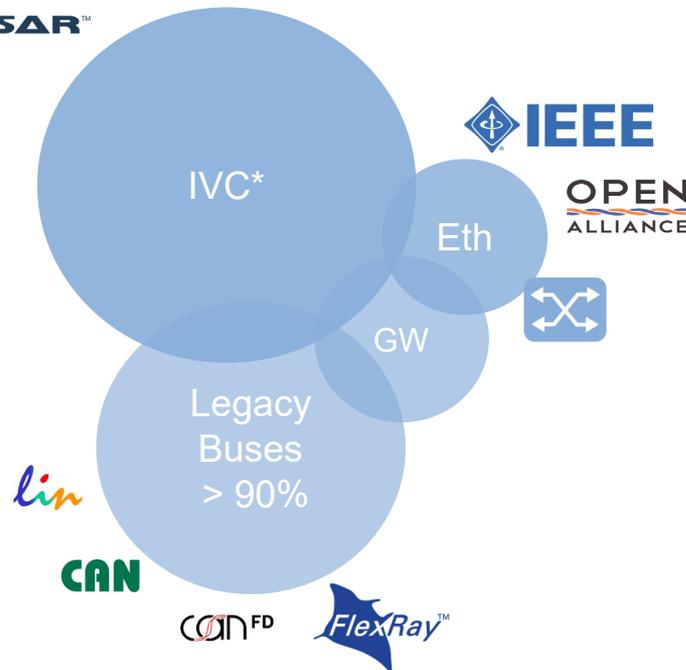
- Legacy buses  
Signal based, gateways
- Ethernet  
Service oriented, switches, mostly for high data rates

More than 90% communication below 10Mbps

## AUTOSAR Ethernet support today

- Switched network only
- 10Mbps up to Gbps

AUTOSAR™



11-2009	1 <sup>st</sup> Ethernet specification in AUTOSAR
11-2019	10BASE-T1S publication, IEEE 802.3cg
11-2020	AUTOSAR R20-11, target for 10BASE-T1S support

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> 10BASE-T1S what is new ?

> AUTOSAR overview

> AUTOSAR solution for 10BASE-T1S

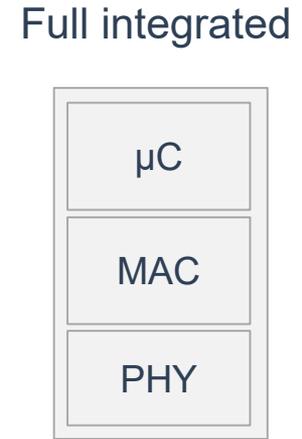
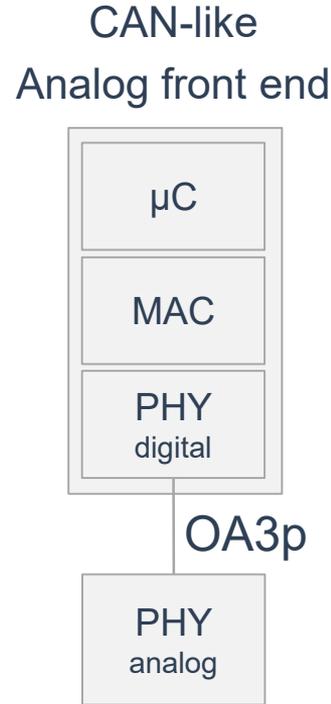
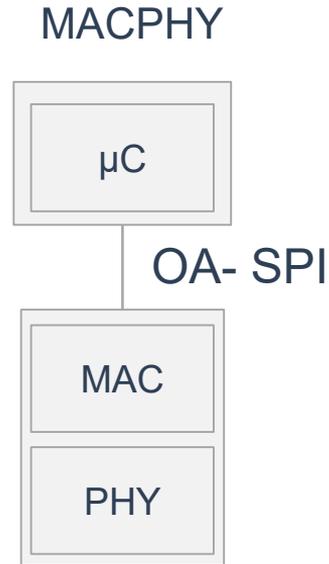
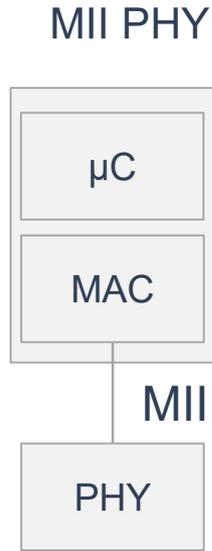
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# 10BASE-T1S what is new ?

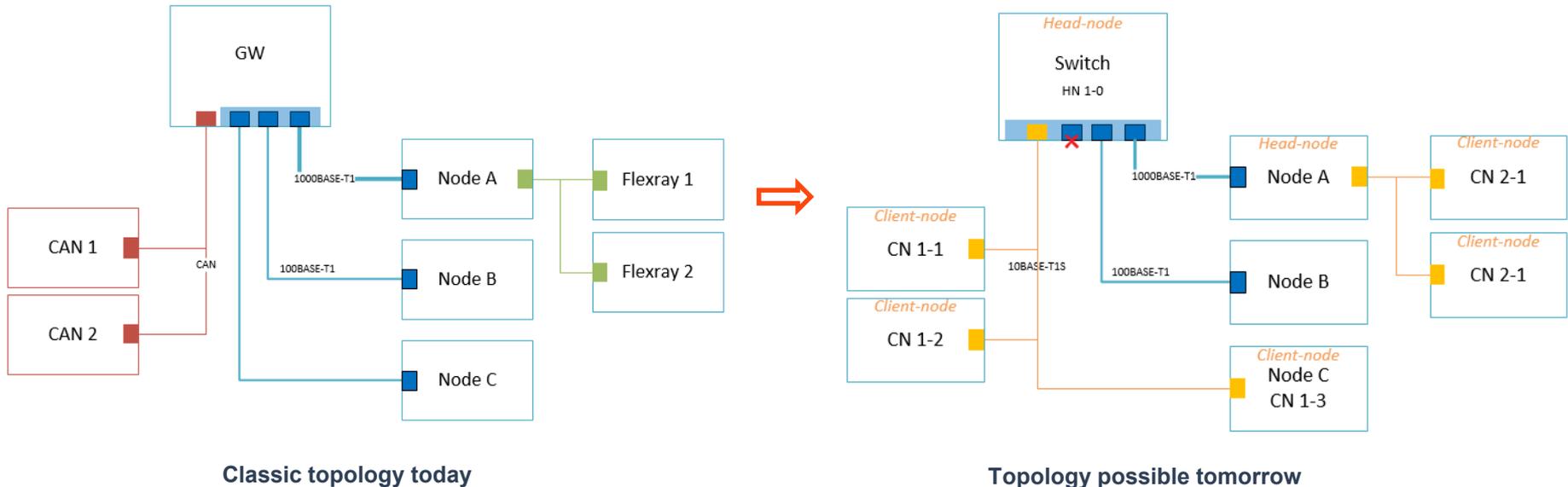
## 1. More PHY products



# 10BASE-T1S what is new ?

## 2. New E/E architecture

- 10BASE-T1S enables Ethernet bus/multidrop topologies



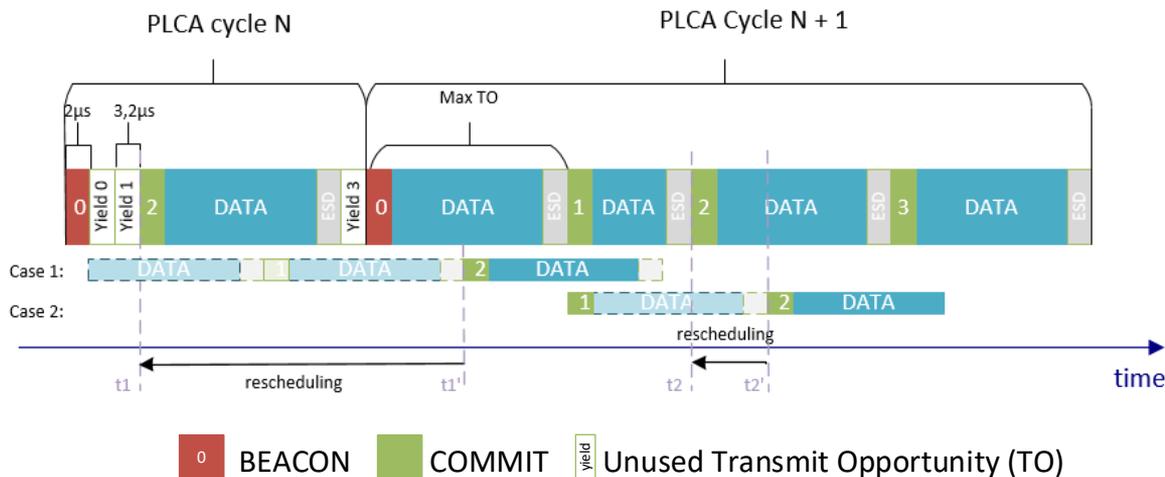
# 10BASE-T1S what is new ?

## 3. Efficient medium access

- PLCA as an efficient new medium access allows for:
  - Reuse of the existing CSMA/CD structure
  - Fair medium access for all participant (Round robin)
  - Bandwidth optimization

### Example early rescheduling scenarios

- Case 1 (Cycle N): only one node transmits.
  - ⇒ Transmission at  $t_1$  instead of  $t_1'$ .
- Case 2 (Cycle N+1): one node does send shorter packet.
  - ⇒ Transmission at  $t_2$  instead of  $t_2'$



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# AUTOSAR actors



## 9 Core Partners



## 55 Premium Partners



## 51 Development Partners



145 Associate Partners  
22 Attendees

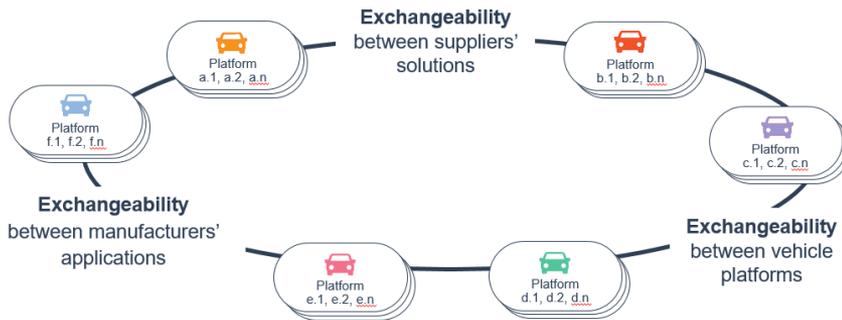


Source: AUTOSAR

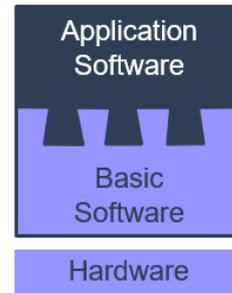
# AUTOSAR motivations

AUTOSAR aims to improve complexity management of integrated E/E architectures through increased reuse and exchangeability of SW modules between OEMs and suppliers:

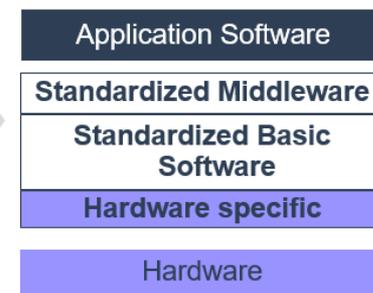
- Decouple SW application from the HW
- Defines clear interfaces
- Specifies data exchange format



## Proprietary



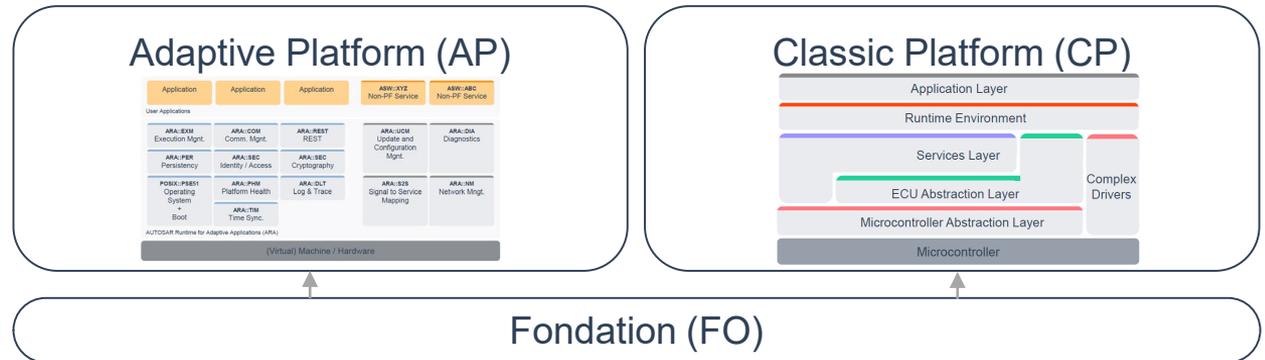
## AUTOSAR™



Sources: AUTOSAR

# AUTOSAR standard

- Set of open specifications (application and basis software stack)
- Unified methodology and exchange format for system description as well as configuration
- Two platforms



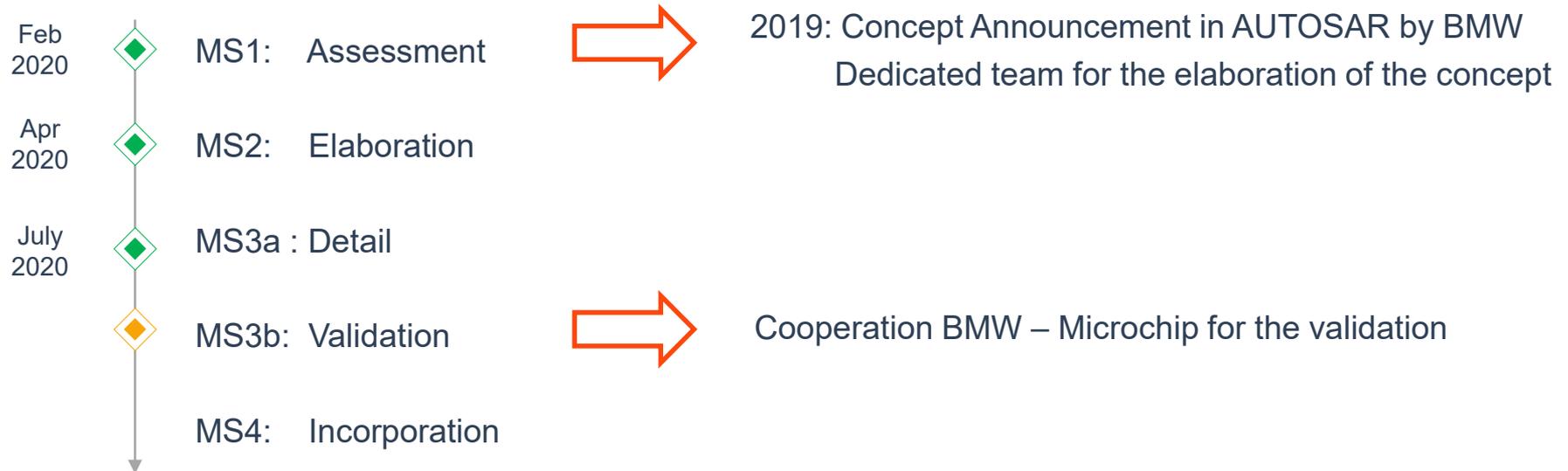
Source: AUTOSAR

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# Integration of 10BASE-T1S in AUTOSAR step by step

## ▪ Milestones



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# 10BASE-T1S impacts in AUTOSAR

## MS2: Elaboration

Which PLCA specificities are relevant for AUTOSAR ?

- Reconciliation Sublayer located in Layer 1
- Remains transparent from MAC perspective
- Half-duplex in multidrop / P2P or P2P for full-duplex / half-duplex

Pre-analysis of the main topics to details in MS3a:

- Component above driver layer untouched
- New configurations parameter related to PLCA
- Multidrop topology

Use cases

- ✓ Multidrop
- ✓ Burst
- ✓ DoIP / OBD
- ✓ Partial network
- ✓ TimeSync (static Pdelay)

### PLCA Configuration Parameters

*plcaActive*

*plcaStatus*

*toTimer*

*nodeID*

*nodeCount*

*burstCounter*

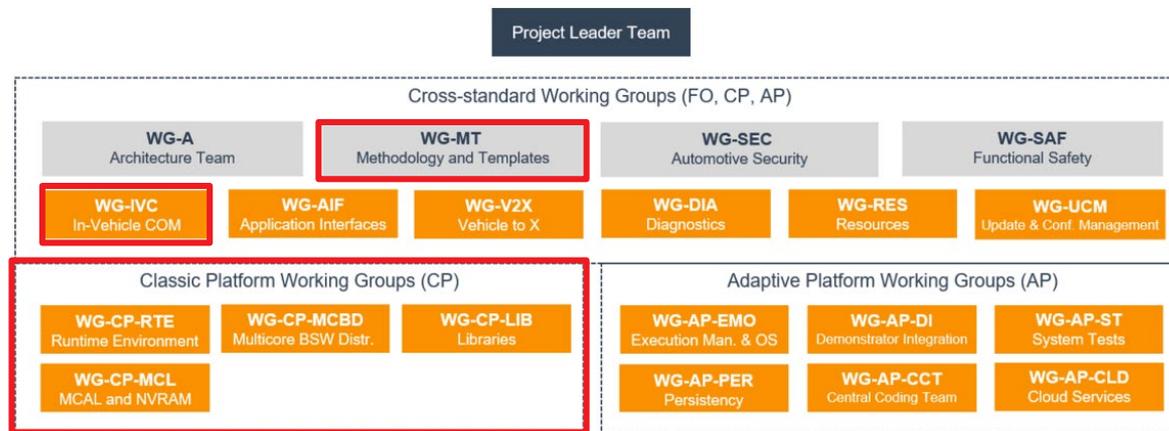
*burstTimer*

# 10BASE-T1S impacts in AUTOSAR

## MS2: Elaboration

First approach is to identify all the concerned working group within the consortium

- 10BASE-T1S is a physical layer
- Constrains: one head node per cluster and all nodes must have same time configuration



Source: AUTOSAR

- New AUTOSAR Working Group for Time Synchronization is initiated for September 2020

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# Solution approach

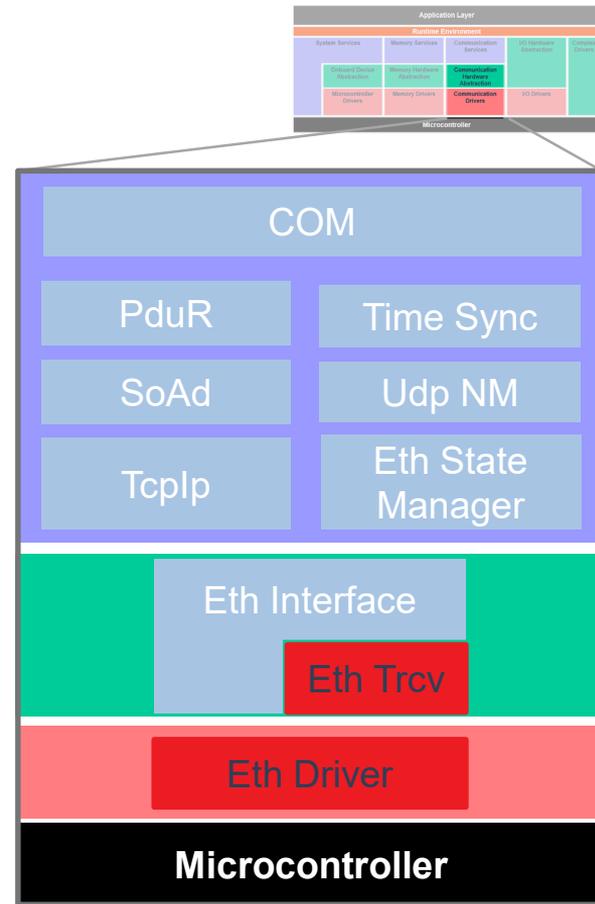
## MS3a: Detail

### Software Specification:

- Impact localized in the low level layers: Eth Driver and Eth Trcv
- Addition configuration parameter for PLCA (node id, burst, ...)
- Buffer handling to prioritize traffic

### System Template / Manifest:

- Implement multidrop topology for Ethernet in model
- Constrain related (Head node unique in sub-cluster,... )



Source: AUTOSAR

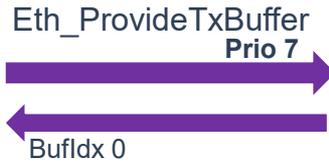
# Solution approach: buffer handling

## MS3a: Detail

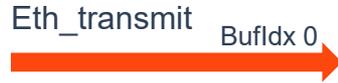


- Affects SWS\_EthDriver
- Optional implementation
- Scheduling before transmission
- Scheduler : simplified CBS (token bucket)
- Priorities from socket connexion

Step1

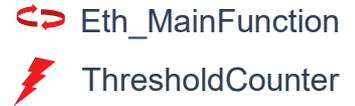


Step2



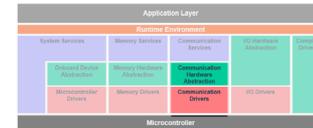
Scheduler

Step3



# Solution approach

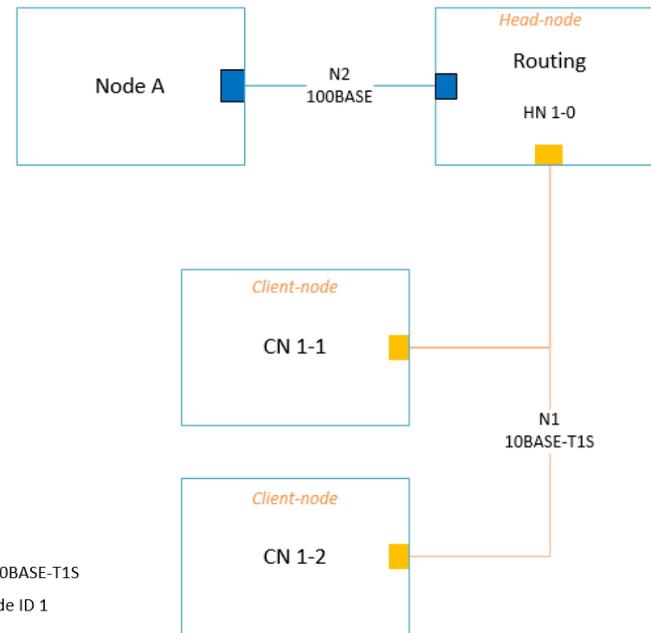
## MS3b: Prototype validation



The 10BASE-T1S support should be validated by a prototypical implementation mostly focused on the Ethernet driver and transceiver driver (CP) for multidrop scenario.

Scope:

- Ensure message routing through the stack and timing are respected
- Buffer handling
- Error scenarios:
  - Lost of Head-node
  - Reactivation Head-node (Reset)



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# Summary

Concept split in 2 parts

- R20-11: 10BASE-T1S MII/Transceiver PHY
- R21-11: 10BASE-T1S with SPI interface and 10BASE-T1S switch integration

10BASE-T1S keeps evolving...

- IEEE
- Open Alliance

...and so does Autosar

- Will keep track on the coming modifications on the Ethernet stack

# Thank you for your attention

## **Concept owners**

S. Chourakorn

M. Zajicek

G. Veloso Cauce

## **Supporters and Reviewers**

B. Sostawa

K. Matheus

Microchip

IVC-CP