

BMW  
GROUP



# PANEL DISCUSSION EIP@ATD

Christoph Gollob

# CHRISTOPH GOLLOB

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*Christoph Gollob studied automotive engineering in Graz in Austria.*

*Since 2010 he is working in the E/E environment at BMW starting in testing of chassis and ADAS ECUs and then taking part in developing the platform for automated driving gaining insight into fail operational systems.*

*Since 2021 he is in the department for networking technologies as a network architect and responsible for safe time synchronization.*



# WHAT IS A SDV

A SDV is having a mainly SW defined character so by changing the SW behavior a different emotional experience can be created like at changing driving mode to sport (chassis control, display, powertrain, etc)

Functionalities in SDV are shifting to using all available data and all available interaction points therefore communication is not linear any more and systems become complex. A standardized toolset like Ethernet is providing the base to cope with this.

Examples would be like scalability, layer separation and security starting on layer 2, time awareness and the most important of all, the seamless connection to the outside world and the backend (e.g. voice recognition).

Defined interfaces and direct connection to the world allow to separate update cycles of HW and SW from each other and implement functionalities not possible in the car as stand alone. On the other hand the hardware and the network have to provide sufficient headroom to allow for feature growth.

A lot of the necessary work for ETH has already started like standardization of switch config, MACsec profile and integration on all speed grades and providing headroom in datarate. Energy consumption will grow in importance.

# QUESTIONNAIRE TO SDV

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**Why is there a need to this discussion on SDVs now?**

A Car is always a mechatronic system but SW is gaining importance and defining its look, feel and driving character. Nothing looks older than old infotainment, but SW updates can keep the car fresh

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**What is the state of the art of SDV activities in the Automotive industry?**

A SDV is having a mainly SW defined character so by changing the SW behavior a different emotion can be created like already at changing driving modes  
The importance of SW is broadly understood but the processes are not as refined as for the mechanical part of the car, still the Customer expects an Experience like he is used to in CE.

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**What makes a software defined vehicle? What new functionality is enabled with the software defined vehicle?**

A barrier free communication base and updateability for all relevant ECUs as well as the separation of SW update cycles from HW updates is the foundation, but will bring challenges at legislation.  
Development process shall model the full vehicle including outside vehicle infrastructure and all enabling processes like data modelling

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**Which features of Ethernet based communication are required to enable the software defined vehicle?**

Almost all of them since ETH is a toolbox solving comparable tasks in comparable SW defined use cases of other industries (Datacenter, house automation, etc)  
Examples like scalability, layer separation and security starting on layer 2, time awareness and the most important of all, the seamless connection to the outside world and the backend (voice recognition) already show this.



# QUESTIONNAIRE TO SDV

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**Is a different network architecture required to support the software defined vehicle?**

Architecture is always driven by demand like safety, start up speed or power. Currently there is a trend to centralization, zonalization and more computing power. The integration of the high speed video data in the ETH IVN is under investigation to get rid of a parallel network.

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**How data rate is important for communication of the SDV?**

You need to incorporate headroom by overprovisioning of the data rate in the beginning.

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**What role do optical communication technologies play? Is the Automotive Optical Ecosystem all set for Next Generation (NG) In Vehicle Ethernet Connectivity?**

As experts agreed at AEC in March up to 10Gbit might still use copper, higher data rates might benefit from changing to optical.

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**What still needs to be done to ensure a timely roll out of SDV in the industry?**

We are already living in a world of SDV (eg Driving Mode). SW development processes are improving bringing more functionality and better User interaction. BMW has started a program called motion to speed up this trend and relevant parts of this are driven by my own hierarchy. Focused on ETH there is a lot already done, missing items are mainly work in progress like standardization of switch config, MACsec profile and integration on all speedgrades, headroom in datarate