CAN Newsletter Online

17TH INTERNATIONAL CAN CONFERENCE (ICC)

From Classical CAN via CAN FD to CAN XL

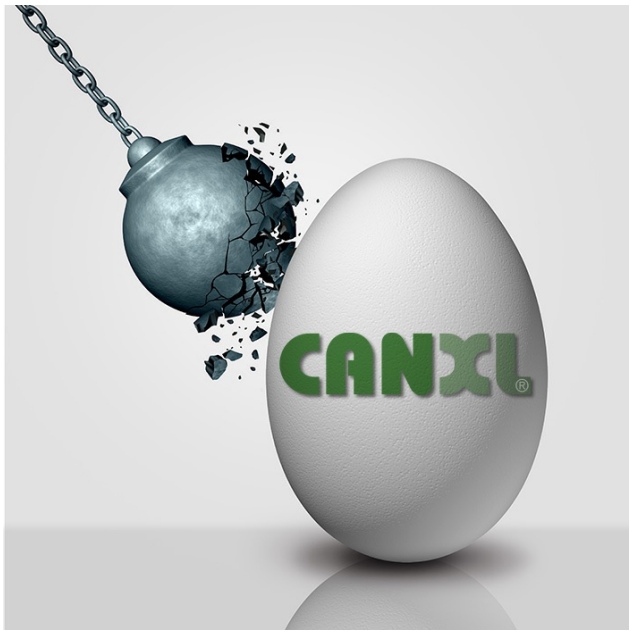
On the four-day 17th iCC CAN experts talked about history, presence, and future of CAN. About 100 engineers from 35 companies attended this event. If you missed to join it, all presentation videos and proceedings can be purchased from CiA.

In 24 presentations covering a broad range of topics, the participants gained latest CAN knowledge and exchanged experiences while C3 sessions (Source: Adobe Stock)

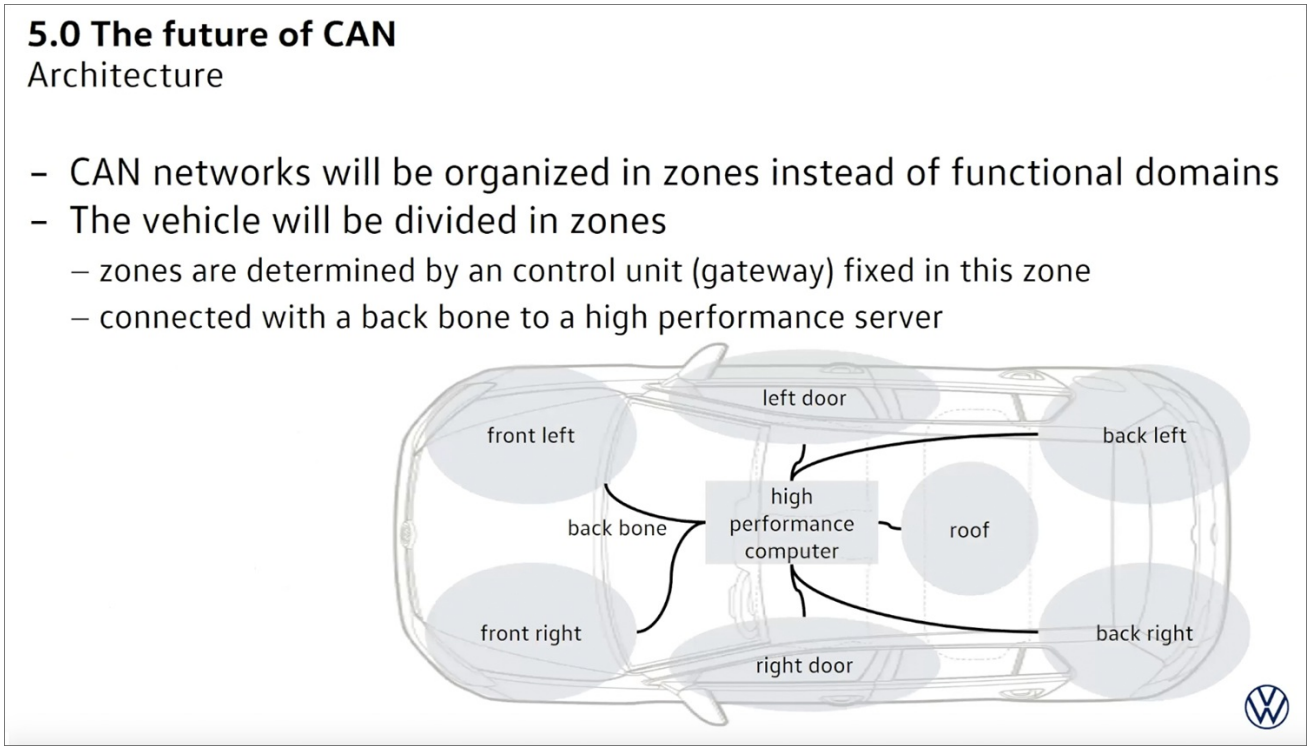
Sponsored by Emotas, ESD, Gemac, Peak, and Vector, the 17th iCC took place from June 14 to June 17, 2021 as an online event for the first time. In a very familiar atmosphere (the experts know each other for several years) 33 speakers informed more than 100 listeners about current CAN XL developments, CAN FD network design opportunities, CANopen (FD) novelties, security, and other topics. Free-of-charge webinars and open-house technical group meetings accompanied by. Overall impression: well-organized online conference with many deep insights. After the presentation, the participants discussed the papers and other topics in the CiA's CAN Coffee (C^3) sessions. Unfortunately missed: personal onside talks as an option for personal networking but the C^3 was a well alternative.

The presentations by Magnus Hell (Infineon) and Johnnie Hancock (Keysight) were peppered with longtime experience, deep knowledge, and detailed understanding of physical transmission on electrical wires. In the C^3 discussion session, they made clear that you can use any CAN transceiver approach for CAN XL networks. Of course, one of the automotive industry requirements to realize a star topology, CAN XL transceivers should have a higher output impedance as CAN FD transceivers and would profit from use of common-mode chokes. End of 2021, Infineon aims to provide a clear statement regarding CAN XL transceiver developments. Hancock proposed to specify additional CAN transceiver parameters, in order to optimize eye-diagram presentation of CAN bits on oscilloscopes.

The discussion on CAN XL markets was answered by Dr. Arthur Mutter (Bosch) with the statement: „This is highly application-specific". He said that CAN XL is very suitable for combining TCP/IP and CAN communication; while CAN FD is optimized for real-time control in a single network segment. Hancock added that a variety of approved CAN FD tools are available, which is not (yet) given for CAN XL. Florian Hartwich stated that Bosch is currently working on a CAN XL IP-module. Dr. Mutter and Dr. Christian Senger (University Stuttgart) emphasized in their presentations the reliability of the CAN XL protocol. The cascaded CRCs with a true Hamming distance of 6 and the other error detection features make CAN XL more reliable than other automotive network technologies. Holger Zeltwanger (CiA) informed the participants that CAN XL related CiA specifications are almost ready developed and would be made available within the next weeks. For members, CiA also scheduled a CAN XL plugfest for July 6 to test first CAN XL protocol implementations on interoperability. Regarding international standardization, Zeltwanger hopes to have it done "before he is really retired".



As the previous generations, also CAN XL is very robust – experts from Bosch and the University of Stuttgart provided the facts (Source: Adobe Stock)



Next-generation Golf network layout (Source: Volkswagen)

The keynote paper by Carsten Schanze from Volkswagen fitted perfect to the conference motto: From Classical CAN via CAN FD to CAN XL. He used the Golf model as an example to demonstrate the development of the in-vehicle architecture from a single network segment via a domain-oriented architecture to a zone architecture intended for the next Golf generations. VW initiated the CAN XL development within the non-profit CiA organization, which is a candidate for many network applications. Schanze, responsible for the physical layer design of the four CAN FD network segments used in the current Golf model, expects that the first CAN XL network could be used to link some low-end radar sensors and to network some multi-media devices. In the first approach CAN XL and Ethernet networks should be used separately. Nonetheless, CAN in Automation (CiA) should trigger the standardization of CAN-XL-to-Ethernet (and vice versa) gateways, added Zeltwanger.

Approaches to link CAN XL and Ethernet networks were presented, as well. Nikos Zervas, (CAST) proposed how to design a CAN-to-TSN Ethernet gateway (time-sensitive networking). Tunneling of CAN-XL frames over Ethernet would be the simplest way to combine the both systems, stated Peter Decker (Vector). Dr. Mutter also informed that IEEE (Institute of Electrical and Electronics Engineers) is currently calling for experts to standardize such a solution, which needs to be supported by CiA expertise.

Regarding classic CANopen and CANopen FD, the two main topics were node-ID assignment and testing respectively simulation. Additionally, Olaf Pfeiffer (Emsa) presented a smart „bridge“ connecting nearly transparently a classic CANopen network segment with a CANopen FD segment. In the C3 session, there was a longer discussion on the limits of this proposed approach. The participants had also several questions on the node-ID claiming proposal by Alexander Philip (Emotas), which seemed to be faster and more reliable as legacy solutions specified in J1939/81 network management and in the CiA 416 CANopen building door profile.

Several iCC papers addressed the design of CAN FD networks. Tony Adamson (NXP) explained in detail the advantages of networks using CAN SIC (signal improvement capability) transceivers as specified in CiA 601-4. Other presentations e.g. from Kent Lennartsson (Kvaser) provided general CAN FD network design hints and kinks. “No CAN SIC transceiver can rescue a badly-designed network”, he summarized. In the C3 discussion, the conclusion was, simulation tools are needed to simplify the CAN FD

network design.

Another highlight was the presentation by Fred Rennig (ST Microelectronics). He introduced the CAN FD Light commander/responder approach, which is currently under development in CiA. This CAN FD implementation with limited functionality (e.g. no arbitration, no error signaling) is intended for price-sensitive applications.

Required network security is very application-dependent. This is why international standards only specify process steps to be considered while secure solution design, introduced Thilo Schumann (CiA) in the according session. On example of a lift control system, Andreas Walz (TU Offenburg) presented how to achieve multi-level CAN (FD) security using available technologies. The solution, jointly developed with Emsa, offers security between devices within a CAN domain, between several CAN domains, and between an Internet-capable end device and a CAN node. According to Infineon, the CANsec solution for CAN XL is future-proof and can be adjusted on the upcoming requirements. It is going to be specified in the CiA 613-2 document.

And, last but not least, Holger Zeltwanger (CiA) proposed how to manage the growing communication complexity in CAN networks using standardized ISO/OSI layer-management options. The “every-one-knows” Holger (as introduced by Dr. Mutter) tries to bring light into this issue since the establishment of CAN in Automation in 1992.

of *CiA's managing director Holger Zeltwanger hold the first and the last speech at the 17th iCC (Source: CAN in Automation)*