CAN XL documents under development

CAN XL is more than just a data link layer plus a physical medium access sub-layer. CAN XL comprises also higher-layer protocol specifications and add-on services.

Originally, in-vehicle network experts from Volkswagen initiated the CAN XL development. In the beginning, the focus was on the CAN XL data link layer featuring a data field ranging from 1 byte up to 2 048 byte. In the CAN XL protocol, the priority indication and the frame acceptance are separated. In Classical CAN and in CAN FD, the CAN-ID field provides both functions: bus access priority and frame filtering. In CAN XL, there is the 11-bit priority field and the 32-bit acceptance field containing address or frame content information.

The CAN XL protocol also embeds OSI (open system interconnections) layer management information. This includes the Service Data Unit Type (SDT) field and the Virtual CAN Identifier (VCID) field. Higher layers provide this information to indicate to the receiving nodes the used next higher OSI layer respectively to run several communication applications in parallel on the same cable. The SDT field is similar to the Ethertype function.

OSI layer management information is nothing new. A typical example is the setting of bit-timing parameters. The software driver of the host controller can do this statically, when it initiates the CAN controller. Another option is a separate configuration interface, e.g. DIP switches or USB or second CAN interface. Alternatively, you can use the same CAN interface running a dedicated protocol, such as specified in CiA 305 for CANopen applications.

The CAN XL protocol controller can be connected to any CAN transceiver with an attachment unit interface (AUI) as specified in ISO 11898-1. Additionally, it features a PWM (pulse width modulation) coding and decoding to be connectable to CAN XL SIC (signal improvement capability) transceivers.

SIG CAN XL and its TFs

The CiA (CAN in Automation) special interest group (SIG) CAN XL coordinates all these specification activities. The physical layer is developed within a task force (TF) reporting to the SIG. There is also the TF higher-layers specifying the SDU types and the CAN XL frame fragmentation, which can be used to improve the real-time capability of the CAN XL communication in case of transmitting frequently blocks of long frames. The TF also supports the extension of the ISO 15765-2 transport protocol for CAN XL frames. Another TF has been established to specify a CAN XL data link layer security protocol. First work drafts have been released for CiA-internal discussions.

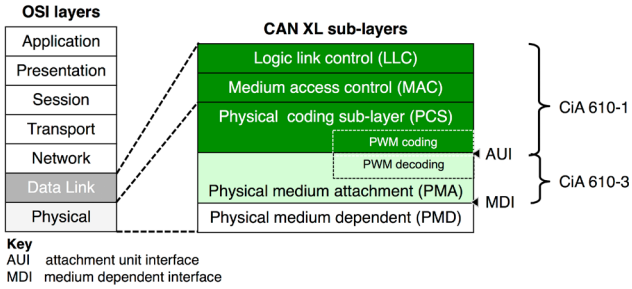

Figure 1: CAN XL lower layers and its mapping to the OSI model (Source: CAN in Automation)

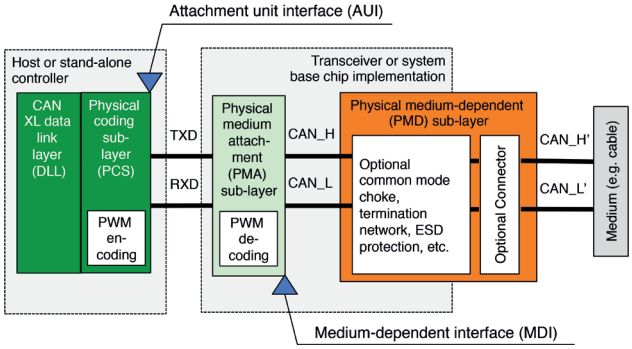

Figure 2: CAN XL lower layers implementation example (Source: CAN in Automation)

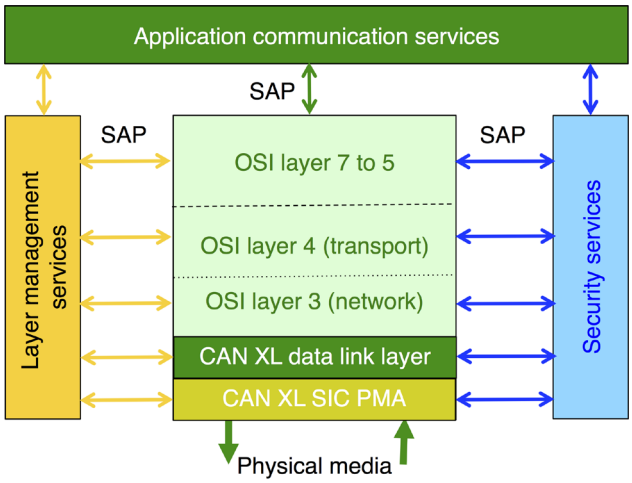

Figure 3: Extended OSI model for CAN XL with additional service access points (SAP) for layer management information as well as security (Source: CAN in Automation)

The set of CAN XL specifications comprises also device and network design recommendations. When the series of CAN XL specifications and test plans are released ▷

Table 1: Planned CiA documents for CAN XL (Source: CAN in Automation)

Number	Title	Status
610-1	CAN XL specifications and test plans – Part 1: Data link layer and physical coding sub-layer requirements	Work Draft
610-2	CAN XL specifications and test plans – Part 2: Data link layer and physical coding sub-layer conformance test plan	Proposal
610-3	CAN XL specifications and test plans – Part 3: Physical medium attachment sub-layer requirements	Work Draft
610-4	CAN XL specifications and test plans – Part 4: Physical medium attachment sub-layer conformance test plan	Proposal (static test)
611-1	CAN XL higher-layer services – Part 1: SDU types	Work Draft
611-2	CAN XL higher-layer services – Part 2: Multi-PDU	Work Draft
611-3	CAN XL higher-layer services – Part 3: Generic transport layer requirements	Proposal
611-4	CAN XL higher-layer services – Part 4: Generic transport layer conformance test plan	No proposal
612-1	CAN XL guidelines and application notes – Part 1: System design recommendations	No proposal
612-2	CAN XL guidelines and application notes – Part 2: PWM coding implementation guideline	Proposal
613-1	CAN XL add-on services – Part 1: Simple/extended content (SEC) indication	Proposal
613-2	CAN XL add-on services – Part 2: Security	Proposal
613-3	CAN XL add-on services – Part 3: LLC frame fragmentation	Proposal

as Draft Specification Proposals (DSP), the SIG CAN XL will start to develop such recommendations. CiA is also planning CAN XL plugfests testing the interoperability of different CAN XL node implementations. A first one should take place in this summer depending on the Covid-19 pandemic situation.

Author

Holger Zeltwanger
CAN Newsletter
pr@can-cia.org
www.can-newsletter.org