

Good to know: Better support for logical devices in CANopen FD

The device type identification of multi-logical devices has been simplified and the EMCY protocol supports the logical device approach.

Logical devices are not new in CANopen technology. They have been introduced already in the beginning, in the mid of the 90ties. The idea is simple: The object dictionary address range for profiles standardized by CiA, 6000_h to 9FFF_h, is divided in eight parts of 800_h 16-bit indexes. For most of the CiA profiles this is sufficient, so that multiple profiles of the same kind or of different functionality can be implemented. For example, the CANopen device can host up to eight CiA 402 drive profiles meaning one CANopen interface is responsible for up to eight motion controllers. Another example is the combination of one CiA 401 (generic I/O) device and one dedicated CiA 420 profile for extruder downstream devices. This functionality is perhaps underestimated. Multiple logical devices can be used to hide sub-layered deeply embedded networks representing up to eight functions. This could also be used as migration path for proprietary sub-networks.

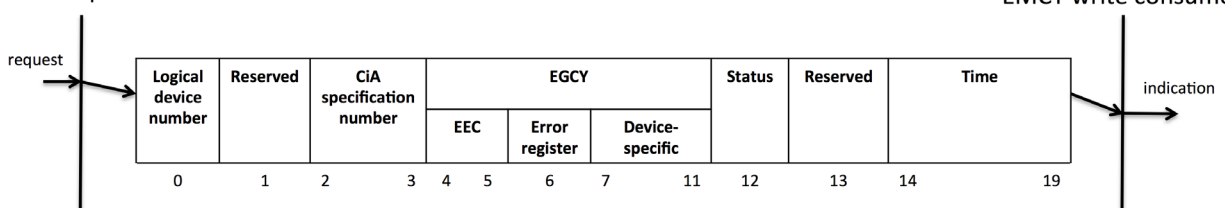
This feature is kept in CANopen FD (CiA 1301) and even better supported as in Classic CANopen (CiA 301). CiA 1301 specifies the device type parameter (Index 1000_h) as an array with up to eight sub-indexes 01_h to 08_h. They have the same structure as the 32-bit device type variable. The lower 16 bit contains the profile number and

the remaining 16 bit provide detailed information about the indicated profile functionality. The array approach is simple: reading the sub-index 00_h, the user knows the number of implemented logical devices. By USDO accesses, you can read the up to eight sub-indexes. After that you know the devices application functionality. In Classic CANopen, it is much more complicated to get this information.

EMCY protocol improvement

CANopen FD is based on the CAN FD data link layer featuring payloads of up to 64 byte. This allows enlarging the Classic CANopen EMCY protocol. The EMCY protocol specified in CiA 1301 provides 20 byte. It contains the same 8 byte as in Classic CANopen: the one-byte error register, the two-byte EMCY error code plus five byte for manufacturer- or profile-specific usage. The CANopen FD EMCY protocol contains additionally the logical device, which caused the production of this message. Further information includes the CiA profile number, the error status, and the time of the error occurrence. This time information is given in the TIME-OF-DAY data type as specified in CiA 1301. ▶

EMCY write producer



(Source: CAN in Automation)

With these improvements in the CANopen FD specification, the handling of multi-logical device implementations has been simplified and enhanced. The EMCY message can now report, which logical device has detected a problem. This is similar to the remote EMCY protocol as described in CiA 320-7, the CANopen-to-CANopen gateway specification. But it can also be used for other sub-layered network technologies.

Logical devices are also suitable for CiA application profiles. The CiA 417 profile for lift control systems can be used to describe up to eight lift applications at one single CANopen interface. The usage of multiple logical devices is still limited today, because device makers have overlooked it. Any device providing power consumption measurements can implement in one logical device its desired function (e.g. CiA 402 or CiA 408) and in a second logical device the CiA 458 energy measurement profile. With such devices the system designer can easily manage power consumption. Especially, aging of devices will be detected as early as possible, because they normally consume over time increasingly energy. This is nothing new, invented and specified already a couple of years ago. ◀

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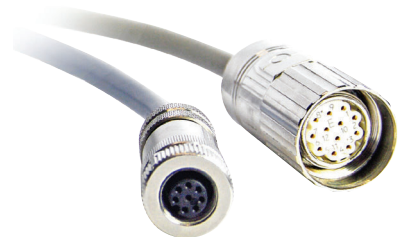
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