

Background information

CAN FD: Review and preview

Nuremberg, 24-02-2015. CAN with flexible data-rate, known as CAN FD, passed the first level of ISO balloting in summer 2014. Unfortunately, some weaknesses in the data link layer protocol were detected after the ISO voting. By now, the CAN FD experts have fixed them by introducing a stuff-bit counter and other protocol improvements. The changes in the CAN FD protocol are user-transparent, meaning the changes have nearly no impact on the usage. Therefore, the software and system development of CAN FD applications is not delayed but chipmakers need to provide new CAN FD hardware. For FPGA implementations this is quite easy to do, but micro-controller manufacturers have to do a complete redesign. This may lead to some delays in the availability of micro-controllers featuring CAN FD.

In 2015, ISO will hopefully release the next version of the ISO 11898-1 standard and the related conformance test plan (ISO 16845-1), which includes the CAN FD protocol. It is also planned to finalize the next version of ISO 11898-2, the high-speed CAN transceiver standard. It will merge the definitions of the previous ISO 11898-2 standard with ISO 11898-5 (low-power mode) and ISO 11898-6 (selective wake-up procedure). This harmonized standard will support bit-rates higher than 1 Mbit/s, which are used in the data-phase of the CAN FD protocol.

CiA will organize further CAN FD plug-fests in Germany and the USA in order to prove the interoperability of CAN FD chips and modules. During these plug-fests, the limits of different network topologies will also be tested. The results will be introduced into the CiA® 601 series of the CAN FD system design specifications and recommendations. In addition, CiA is going to develop CAN FD related specifications for commercial trucks (physical layer and application layer) in the CiA® 602 series. In spring 2015, CiA will release the CiA® 301 version 5.0 (CANopen FD), which will support the CAN FD data link layer.

Besides the higher throughput, with CAN FD the payload per data frame is increased to 64 byte instead of the 8 byte provided in Classical CAN. "CiA supports the substitution of Classical CAN by CAN FD enabled hardware," said Holger Zeltwanger, CiA Managing Director, "so that in a couple of years all new products will support CAN FD, regardless of whether the user requires the higher bit-rate and the longer data frames." CAN FD will be as reasonable in price as Classical CAN was. Additionally, the power consumption on a CAN FD network is lower than other communication technologies and its robustness is much higher as well. The reliability



of the CAN FD protocol is even better than Classical CAN, which was already better than other commercially available networks. The simplicity of the CAN FD protocol usage is not more complex than Classical CAN, but system designers need to respect the general electrical design rules more than in the past, due to the higher bit-rate (up to 8 Mbit/s) during the data-phase.

Another important aspect is the multi-drop feature. There is no need for hubs or switches or other active electronic components with a meantime between failures (MTBF). “Active elements are single-points of failure,” explained Holger Zeltwanger, “which are not acceptable in mission-critical applications and in applications which require a high availability.”

For questions and further information please contact Cindy Weissmueller (weissmueller@can-cia.org). We provide exclusive technical articles.

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