First-hand information on CAN FD

Full-house in Detroit: More than 100 participants listened to Marc Schreiner from Daimler’s Research and Development department explaining CAN bandwidth requirements in trucks

Officially introduced on the international CAN Conference (iCC) in March 2012, the CAN FD protocol has been implemented by Bosch in an FPGA. During the CAN FD Tech Day in Detroit (October 2012) several chipmakers presented their roadmaps for CAN FD products. This year, CiA will organize a similar event in Europe. On March 19, the second CAN FD Tech Day will be held in Frankfurt (Germany). The speakers will update their presentations given in Detroit. In addition, Bosch, Daimler, and NXP will make available their jointly developed CAN FD bridge module. It comprises two CAN FD ports and a classic CAN interface. This module is intended for evaluation purposes. It comprises one V850 micro-controller with on-chip CAN module by Renesas and two Altera FPGAs implementing FPGA-based CAN FD solutions for key automotive customers are in development and the first micro-controllers with embedded CAN FD protocol support will soon become available.

Statement on CAN FD from a semiconductor manufacturer

Wolfgang Wiewesiek, Manager Automotive Networks at Fujitsu Semiconductor Europe stated: “Fujitsu is selling large quantities of CAN nodes every year and monitors the trend of demand for higher bandwidth in the automotive network domain as well as in industrial applications closely. Fujitsu therefore welcomes the latest CAN protocol enhancement ‘CAN with flexible data rate’ as an excellent choice for the future, prolonging the lifetime of this successful network technology. Fujitsu will integrate the M_CAN IP from Bosch in its new micro-controller designs for automotive applications. In addition, products using the legacy CAN IP will – in case of new designs – be prepared for CAN FD tolerance, allowing a smooth migration option for existing network architectures.

Related articles
F. Hartwich: CAN with flexible data-rate; in CAN Newsletter, June 2012

Editor’s comment
“This issue of the CAN Newsletter contains some detailed articles about CAN FD implementations and technology information. Most of the articles are based on the presentations given at the CAN FD Tech Day in Detroit. In the CiA, three Task Forces have started to publish recommendations and application hints. Perhaps, we can report in the June issue about the first work results.” Holger Zeltwanger

Links
www.bosch.com
www.can-cia.org
www.nxp.com

CAN FD protocol
The CAN FD protocol is backwards compatible to the CAN protocol internationally standardized in ISO 11899-1. The improved protocol uses a second higher bit-rate starting in the control field and ending before the Acknowledgement field. The improved message format allows also longer data fields up to 64 byte. The CAN FD enhancements have been submitted to the International Standardization Organization (ISO).
CiA establishes Task Forces dealing with CAN FD networking

The CAN in Automation (CiA) international users’ and manufacturers’ group is calling for CAN FD experts interested in developing recommendations and best practice solutions for the improved CAN protocol. The Task Force “System design” will focus on finding applicable migration paths from today’s “classic” CAN networks to CAN FD based networks. In addition, this Task Force may evaluate all new protocol features. The assigned tasks include solutions for mixing improved CAN and classic CAN nodes in one network. The Task Force “User interface and device design” should harmonize supported functionalities for CAN FD capable CAN controllers as well as the CAN module’s CPU interface. In addition, this group may discuss the handling of the CAN controllers memory resources with regard to long data frames. The Task Force “Physical layer design” is going to develop recommendations for topology, bit-timing, etc. All Task Forces report to the CiA Interest Group “CAN FD”.

Infineon will provide the improved CAN protocol with flexible data-rates in its micro-controllers. The chipmaker intends to support bit-rates of up to 8 Mbit/s using linear bus topologies. The IFX transceiver chip series is already specified for transmission speeds up to 2 Mbit/s. Faster one will be developed. NXP has announced the SJA1145 SPI-to-CAN FD chip, bridging micro-controllers to the improved CAN network. The stand-alone bus-controller will be available in samples end of this year. Besides the CAN FD controller, it also comprises a CAN transceiver with partial networking function compliant to ISO 11898-6, which is validated for data-rates up to 2 Mbit/s. The CAN FD implementation will support data-fields up to 64 byte.

In Detroit, Kvaser showed on site its CAN FD implementation, a non-commercial FPGA solution. Ad hoc, it was connected to the CAN FD demonstrator built by Bosch and the tool partners Etas and Vector. And it was working in the demonstrator. You saw that it was acknowledging the CAN FD frames and switched correctly to the higher bit-rate and vice versa.

General Motors and Daimler’s truck division explained in Detroit their requirements for higher performing CAN networks. They want to keep the robustness (physical layer) and the reliability (in particular, the Hamming distance of six provided by the classic CAN protocol) of the proven CAN communication. Daimler’s engineers already spent some effort in the research of the CAN FD communication quality. They simulated the signal integrity in FD networks for bit-rate up to 2 Mbit/s. In a first estimation, the average bit-rate will approximately be doubled by an arbitration speed of 500 kbit/s and 2,5 Mbit/s for the data phase using only 8-byte data frames and 29-bit CAN-IDs (extended frame format). In truck applications the gain of average bit-rate is limited by used extended frame format, and arbitration speed of 800 kbit/s due to topological constraints.

General Motors is interested in CAN FD for the end-of-line programming of ECUs. The increasing size of programs requires more and more time. And time is money. Reducing the production time, meaning the time to download software, saves a lot of money. The US carmaker will use in second step CAN FD also for the normal operation in the in-vehicle networks. There is some rumor that the other two big US carmakers – Chrysler and Ford – are interested in CAN FD, but there is no official statement available. Volkswagen is according to Carsten Schanze in the evaluation process and has not taken any decision regarding CAN FD. Guenther Linn said that Audi is also evaluating the new protocol, especially the compatibility to the selective wake-up transceivers as standardized in ISO 11898-6. According to Tim Robertson from Nissan, the Japanese carmaker is also studying the improved CAN protocol. Thomas Lindner from BMW stated that the Bavarian company has not yet started to look in detail to CAN FD. Other carmakers are not willing or able to make commitments on CAN FD. Some automobile suppliers are ready to migrate to CAN FD communication, but also they have not made an official commitment. Except Bosch, the inventor of the CAN improvements will support CAN FD in all of its powertrain ECUs.

No communication protocol without tools. From the beginning, the toolmakers were involved in the pre-development of the CAN FD protocol. Etas and Vector made already their CAN tools ready to support CAN FD. Both companies presented prototypes in Detroit connected to the CAN FD demonstrator. The software suppliers for non-automotive applications, especially the CANopen protocol stack providers are waiting for the first CAN FD micro-controllers. In some CAN FD information events organized and co-organized by CiA, several CiA members (e.g. Etas, Ixxat, Port, Vector) presented the possibilities of CANopen applications using the improved CAN protocol. “Besides the European CAN FD Tech Day, CiA will schedule additional information events on request of interested parties in other countries,” said Gisela Scheib.

Holger Zeltwanger
PCAN-Repeater
Repeater for the galvanic isolation of 2 CAN bus segments, bus status display, switchable termination.

PCAN-Explorer 5
The universal tool for developing and monitoring CAN networks.
- Extensive user interface improvements: File management via projects, configuration of all elements with the property editor, and window arrangement using tabs
- Simultaneous connections with multiple networks / CAN interfaces of the same hardware type
- Configurable symbolic message representation
- Data logging with tracers and the 4-channel Line Writer
- VBScript interface for the creation of macros
- Functionality upgrades with add-ins (e.g. Plotter, J1939, CANdb Import, or Instruments Panel add-in)
- User interface language in English or German

PCAN-PCI Express
CAN interface for PCI Express slots. 1, 2, and 4-channel versions with galvanic isolation available.

PCAN-PC/104 Express
CAN interface for PCI/104-Express systems. Available as 1-channel, 2-channel, and opto-isolated version.

PCAN-PC/104-Plus Quad
Four-channel CAN interface with galvanic isolation for PC/104-Plus systems.

PCAN-Router
Programmable CAN router with 2 CAN channels. Available with D-Sub or Phoenix connectors.

PCAN-PCI/104-Express
CAN interface for PCI/104-Express systems. Available as 1-channel, 2-channel, and opto-isolated version.

PCAN-Diag 2
PCAN-Diag 2 is a handheld CAN bus diagnostics unit. The new model offers enhanced functionality:
- Clear CAN traffic representation in lists, configurable symbolic representation of received messages
- Transmission of individual CAN frames or CAN frame lists
- Built-in 2-channel oscilloscope for detailed analysis of the differential CAN signal or an optional external signal, triggering by CAN IDs or other events
- Bit rate detection, bus load and termination measurement
- Windows® software for easy device configuration and transmit list definition, upload via USB connection
- Storage of diagnostic results (CSV, BMP) on an internal 1 GB mass storage USB device

PCAN-PC/104-Plus Quad
Four-channel CAN interface with galvanic isolation for PC/104-Plus systems.

PCAN-PCI Express
CAN interface for PCI Express slots. 1, 2, and 4-channel versions with galvanic isolation available.

PCAN-miniPCIe
CAN interface for PCI Express Mini slots. Single- or dual-channel versions with isolation available.

PCAN-USB Pro
High-speed USB 2.0 interface with galvanic isolation for connecting up to 2 CAN and 2 LIN busses.

You can find CAN to LAN or WLAN modules, the PEAK-gridARM evaluation board for the gridARM microcontroller, and the PCAN-Router in a DIN rail housing at PEAK-System in hall 1, booth 616.

www.peak-system.com
Otto-Roehm-Str. 69, 64293 Darmstadt, Germany
Phone: +49 6151 8173-20 – Fax: +49 6151 8173-29 – E-mail: info@peak-system.com