In the beginning, the CANopen specification was named CAL-based communication profile for industrial systems. It was developed under the umbrella of Esprit (European Strategic Program on Research in Information Technology), a research program of the European Community. The title of the project 7302 was ASPIC, short for “Automation and Control Systems for Production Units using an Installation Bus Concept”. The objective was to develop control architectures and devices to enable flexible and modular combination of existing manufacturing cell units. The researchers led by Dr. Mohammad Farsi (University of Newcastle) and Stefan Reitmeier (Bosch) decided to use the CAN Application Layer (CAL) protocol, developed by CiA. CAL was a pure application layer approach according to the OSI open systems interconnection model. However, it was in some respect an academic approach and had various fathers: Main contributions came from Tom Suters (Philips Medical Systems), as well as Prof. Dr. Konrad Etschberger and Prof. Dr. Wolfhard Lawrenz, both working at German universities for applied science. Of course, other CiA members had also contributed ideas.

The ASPIC project’s objective was to develop an application layer that was easy to implement, dedicated to embedded machine control. Under the leadership of Bosch, several companies (Moog, ADL Automation, and J.L. Automation) and institutes (Newcastle university and Reutlingen university of applied science) specified the first version of what is today known as CANopen. Main contributors were Dr. Mohamad Farsi and Prof. Dr. Gerhard Gruhler. The first version already defined PDOs (process data objects) and SDOs (service data objects). The synchronous transmission of PDOs was introduced as well as Network Management (NMT) and Emergency messages.

In the early days of CANopen, CAN Remote Frames were still in favor, which is why Node Guarding was based on them. Later, Node Guarding was substituted by the Heartbeat mechanism. The first CANopen networks also used remotely requested PDOs. Nowadays, CiA recommends not using remote frames at all.

Where have the years gone?

It seems to me like it was yesterday that the first CANopen documents came to my desk for editing. Now, 20 years later, CiA’s secretaries have to maintain more than 15000 pages of CANopen specifications. The success of CANopen has many fathers and a few mothers. It was a joint success, mainly of small and medium-sized companies and some big machine building enterprises. It constitutes one of the rare cases of a company-independent communication standard – not driven by marketing money but by a community of individuals. And even after 20 years, the story has not come to an end. More development will be necessary in the coming years. I am sure that CAN FD will have an impact on existing profile specifications and will initiate further applications, which will benefit from the larger payload and increased throughput.

Holger Zeitwanger

In the beginning, not all CiA members were in favor of CANopen. Many preferred non-standardized application layers, so called layer-2 protocols.
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- Electrically isolated
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Operating Systems
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CAN Tools
- CANio: Display and recording of CAN message frames
- CANplot: Display of online/offline CAN data
- CANrepro: Replay of pre-recorded CAN message frames
- CANscript: Python scripting tool to handle CAN messages
- COBview: Analysis and diagnostics of CANopen nodes

The tools are free of charge on the driver CD or can be downloaded at www.esd.eu
The CANopen specification published as CiA 301 was one of the most successful Esprit research projects. One of the reasons was that the specification was handed over to CiA for further developments and maintenance. From the beginning, several companies implemented the higher-layer protocol in real applications. Of course, several reviews and updates were necessary before CANopen became a stable specification. Version 3.0 was the first release used in products and systems. This version was valid from 1996 to 1999. Some applications still use this version today.

CANopen can be regarded as the application layer of small and medium-sized suppliers. It is the only independent industrial communication system not promoted by one market-leading company. It can also be regarded as the solution of system designers, because some machine builders have chosen this approach to be independent from the suppliers. Among these machine builders are Heidelberger and Siemens Healthcare. In 1995, CiA presented the very first CANopen multi-vendor demonstrator equipped with products from Moog, Selectron and others at its Hanover fair booth.

Holger Zeltwanger

Devicenet is also 20 years old. Originally it was developed by Allen-Bradley. As early as 1992, Allen-Bradley and Honeywell, together with the Cincinnati Milacron machine builder, started specifying a CAN-based network solution. In March 1994, Allen-Bradley introduced Devicenet at the ICEE show in Chicago. One year later, the company initiated the Open Devicenet Vendors Association (ODVA). At that time, CiA also promoted Devicenet and sold the specification in Europe. But this cooperation ended after a few years.
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