VECTOR >

CANalyzer .CANopen

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1 Introduction

CANopen® is an open, CAN-based communication protocol. Its wide range of application includes areas such as transport and control technology, measurement systems, medical technology, railway technology, maritime applications, and much more – in short where ever great flexibility and rapid data transmission are in demand. The specification is built on the experience of many component manufacturers and users, resulting in a well-established standard that is maintained by the CAN in Automation (CiA®) user organization.

The primary application for the .CANopen Option for CANalyzer is the development of CANopen systems. In this environment the tool is primarily used to analyze and stimulate the CANopen-specific message traffic on one or more CAN buses.

1.1 Overview of Advantages

> Integrated configuration, analysis, simulation and test tool from a single source

> Support of commonly used CANopen standards

> Convenient interpretation of the bus traffic by protocol descriptions and color differentiation of CANopen services

> Automatic generation of a CAN database using EDS files

> Abstracted configuration of PDOs by graphically linking process data

> Easy dialog-based access to CANopen device parameters

> Logging of the CANopen bus traffic with later offline analysis

1.2 Features

CANalyzer's powerful functionality together with the functional expansions for CANopen gives you a tool that can be used both in the development of CANopen systems as well as their startup and maintenance. CANalyzer .CANopen Option makes high-performance, CANopen-specific functions for analysis and configuration available to the developer. This is a prerequisite for reliable and efficient interaction with CANopen networks.
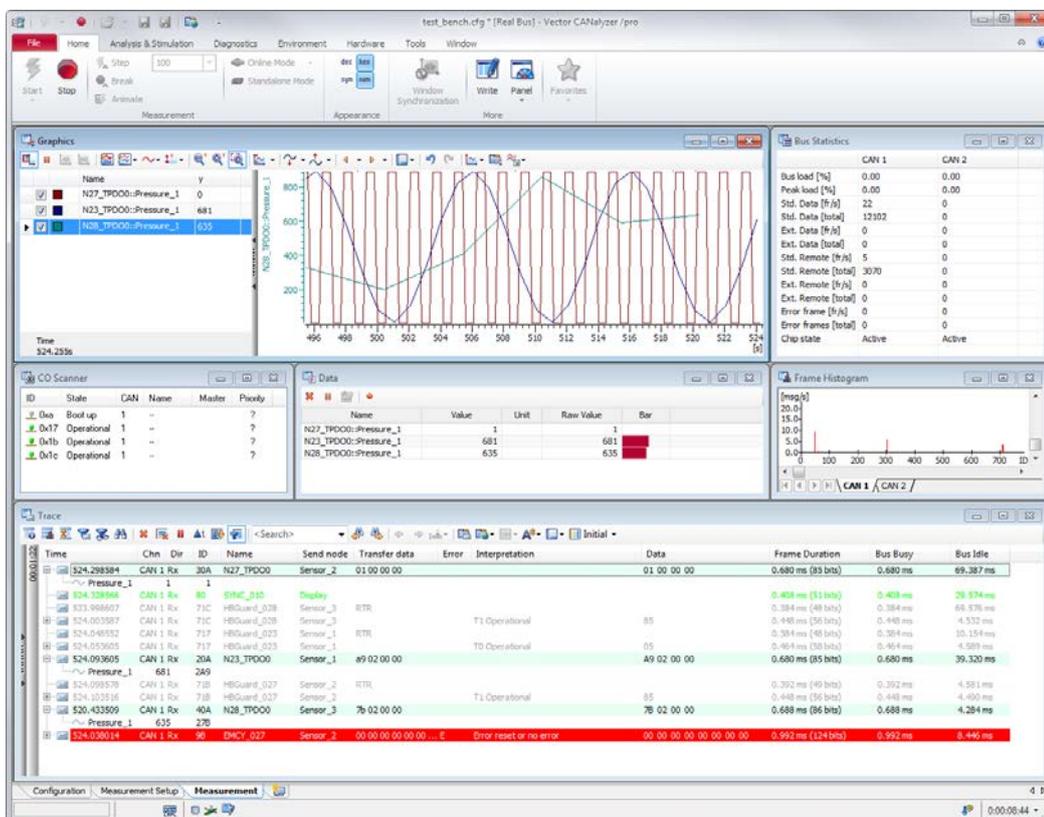

Figure 1: CANalyzer .CANopen enables the easy analysis of CANopen specific data.

1.3   Hardware Interfaces

CANalyzer .CANopen supports all current Vector CAN network interfaces.

1.4   Further Information

> **Vector Download Center**
Various documents related to CANalyzer are available on the Internet. In the Demo version, you can find sample configurations for the various areas of application and detailed online Help texts, describing all CANalyzer functions. In addition, free add-ons for specific CANopen profiles are available in the Download Center. On top of that, you benefit from our valuable know-how in the form of technical articles and application notes.

> **CANalyzer Feature Matrix**
You can find more information on variants, channels and bus system support in the feature matrix.

2   Supplied Components and Functions

Along with the base tool CANalyzer, CANalyzer .CANopen also contains the ProCANopen configuration tool and the CANeds EDS editor. CANalyzer .CANopen extends basic CANalyzer functionality as described in the following.

> Configuration of CANopen devices

> Interactive access to CANopen devices

> Interpretation of CANopen messages

> Interactive generation of CANopen messages

> Creation and testing of EDS files

> Protocol-specific representation in the Trace window

> Protocol monitoring

> Graphical representation of devices

> Network management, guarding, heartbeat

> Setting the baud rate and node ID via Layer Setting Services

> Use of the CiA standard file formats EDS/DCF

2.1   Differences to CANoe .CANopen

CANalyzer .CANopen offers the same analysis functions as CANoe .CANopen. However, you can also use CANoe .CANopen to create CANopen simulation models or generate them at the press of a button based on the device descriptions (EDS files). For more information on CANoe .CANopen, please refer to the separate product description.

3   EDS Formats

CANalyzer .CANopen uses the standardized file formats EDS and DCF to store and to exchange data. Both the conventional INI format and XML format specified in CiA311 are supported.

4   Project Planning with ProCANopen

CANalyzer .CANopen contains ProCANopen to enable efficient and quick planning of complete CANopen networks as well as devices. You are supported in all project phases, including planning, development, start-up, and service. Through the extensive functions, combined with an intuitive user interface, you can concentrate immediately on the definition of the system parameters. ProCANopen executes the concrete and CANopen-conforming implementation of projects automatically. This significantly reduces the configuration effort required for extensive systems. The quality of the configuration thus created is increased, which in turn increases security of the system.

4.1   Graphical Representation

The individual devices of a CANopen network are shown in a summary graphic that shows each device's name, Node-ID, and optionally a bitmap. They can be grouped, for example to represent their functional relationship to one another.

It is easy to read-in a network that already exists. This involves reading objects from the object dictionary and comparing them to existing EDS files. The assignment of an EDS file in a real device in the network is performed automatically. If no EDS is available the objects existing in the object dictionary are found and displayed according to their device type. Modular devices are also supported

4.2   Definition of Communication Parameters

One of the main tasks of ProCANopen is the convenient generation and clear display of communication channels. Network nodes can be controlled by dialog or linked graphically. In the case of a graphical link, the desired nodes are selected with the mouse. A graphical display appears of all process data for these devices. They can be connected directly with the mouse (see figure).

ProCANopen automatically performs the implementation of these links to the corresponding CANopen mapping tables. There is no need for you to become involved in the complex interconnections and details of these tables. ProCANopen generally makes standard settings that can be used universally for attributes and connections such as priority and transmission type. If necessary, these settings can be conveniently changed.
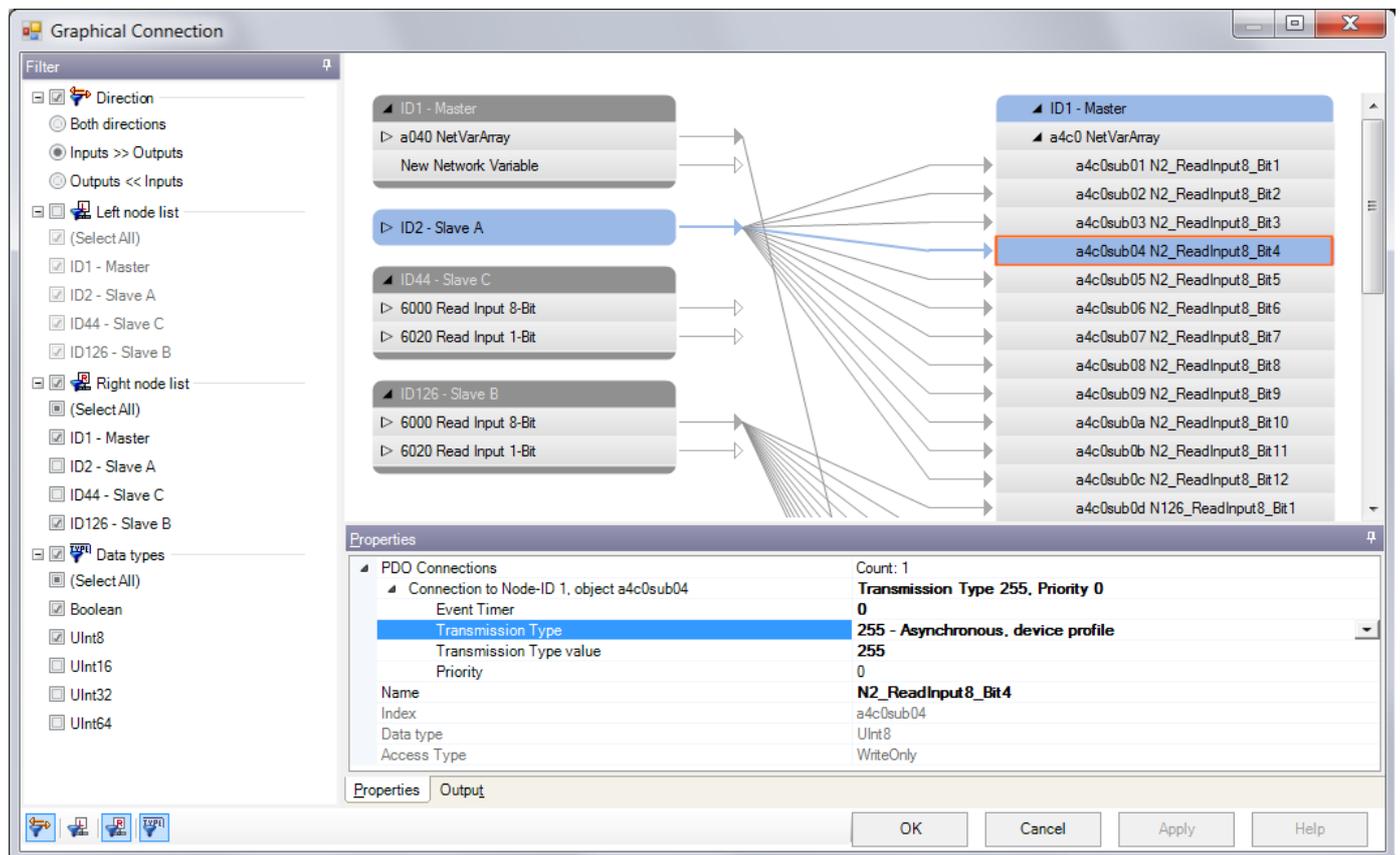

Figure 2: Linking of process variables via drag & drop: ProCANopen calculates the required communication parameters automatically.

4.3   Object Dictionary

The object directory for an individual device is shown in a tree structure that is structured as a function of user inputs. The objects to be shown are taken from the EDS file for the relevant device. Attributes are shown for each individual object in an easy to read format. It is easy to read-out and modify device parameters that are mapped into a device by object dictionary entries. This is how the user can configure necessary settings in a device. In the modification of PDO parameters the access dialog considers the access order specified by the DS301 communications profile.

If no EDS file exists for a device, it is still possible to access the object dictionary by a special dialog. Changes to device parameters are saved separately for each device in a Device Configuration File (DCF). Unfortunately, in practice it is often the case that the EDS files for devices are incomplete. ProCANopen lets you create new objects or assign the proper attributes to existing objects using the CANeds EDS editor that is included with the product. EDS files can be checked by the integrated EDS Checker. This same test program is also used for the conformance test of a CANopen device.
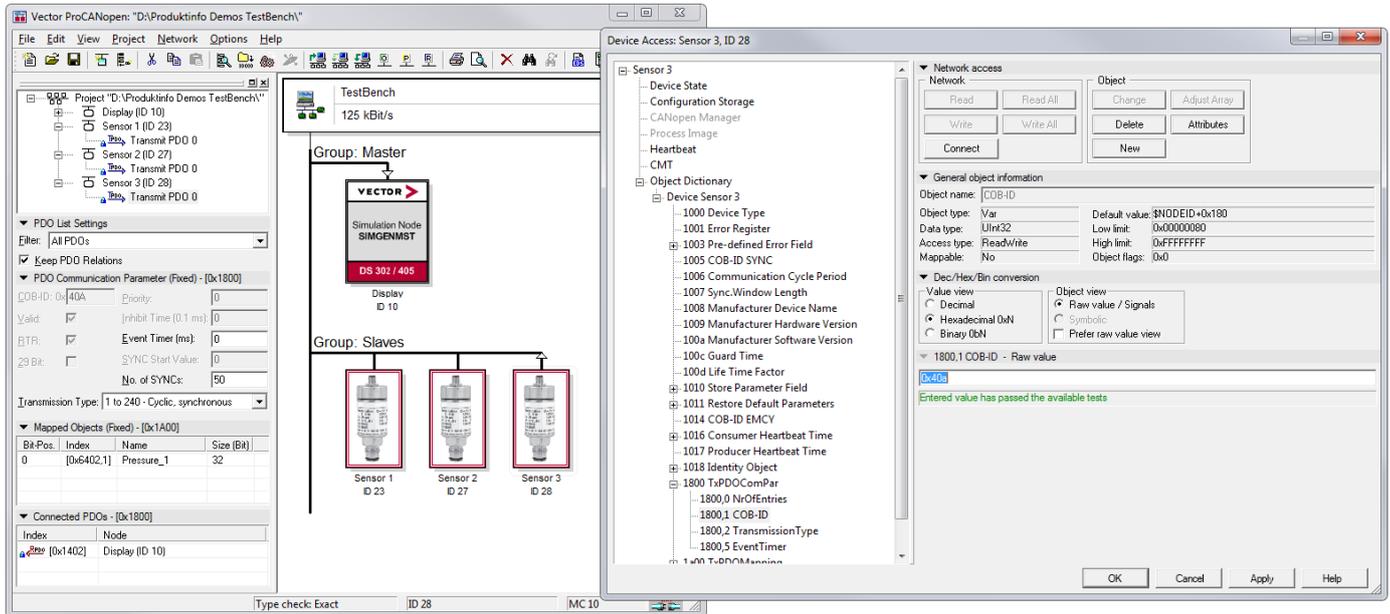
4.4   Interactive Device Access

Figure 3: Convenient and clear module configuration with the aid of interactive device access

ProCANopen is a project-planning tool that allows interactive communication with simulated and real devices. The object directories of the devices can be read and configured. Services are available for startup of CANopen devices such as start, stop, reset, and enter-preoperational.

4.5   Generation of a CAN Database for Use in CANalyzer .CANopen

ProCANopen automatically converts the standardized EDS files into a CAN database. All you need to do is add the desired EDS files to a ProCANopen project and, with the press of a button, you generate a CAN database and link it in a CANalyzer .CANopen configuration. Messages or process data can then be accessed symbolically in CANalyzer .CANopen afterwards

4.6   Network Management

NMT commands can be executed to control status of connected devices. Node monitoring features such as heartbeat or guarding mechanisms can be started and stopped at any time – including for multiple nodes simultaneously.

4.7   Download of Project Data and Start-up

ProCANopen saves all project planning data in standardized file formats (DCF). This ensures compatibility with other software packages. In addition, ProCANopen allows for direct download of all data onto the individual devices of the network. Master functions integrated into ProCANopen such as starting individual nodes and booting the entire network make it possible to start up a system quickly and reliably.

ProCANopen supports central saving of all configuration data in a CANopen Manager. This involves sending the configuration data from the individual DCFs to the object dictionary of the CANopen Manager. The "Concise Format" defined by CiA is used for this. When the CANopen system is started, the CANopen Manager configures each connected node individually based on this configuration data.

For CANopen devices that save changes internally in the object dictionary, it is possible to work with the predefined memory commands "Store" and "Restore". These commands cause a CANopen device to save the configuration and restore default values, respectively.

5   Communication Monitoring

In a Trace window the CAN message traffic is displayed while simultaneously interpreting the protocol information it contains. The user not only sees the service that is currently being executed, but can also examine all relevant service parameters. This information is displayed in clear text. To simplify analysis, CANopen services are distinguished by different font and background colors. The user gets a quick overview of the chronological order within protocol sequences for the observed CANopen services. This makes it significantly easier to locate errors in a real system.

CANalyzer .CANopen also monitors for the correctness of individual protocol sequences. This involves detecting whether the protocol information was properly entered in the CAN message. To ensure that the described device information is also available in CANalyzer .CANopen, just add a CAN database that is automatically generated in a ProCANopen project. Messages or process data can then be accessed symbolically in CANalyzer .CANopen.

6   Analysis

Not only is the Trace window, but also the familiar Data and Statistics windows of the standard version of CANalyzer are available for the analysis of CANopen data. in addition, the CANopen Scanner evaluates CAN messages and shows the active nodes in a list. It displays other node-specific information as well, such as the node state or device name.
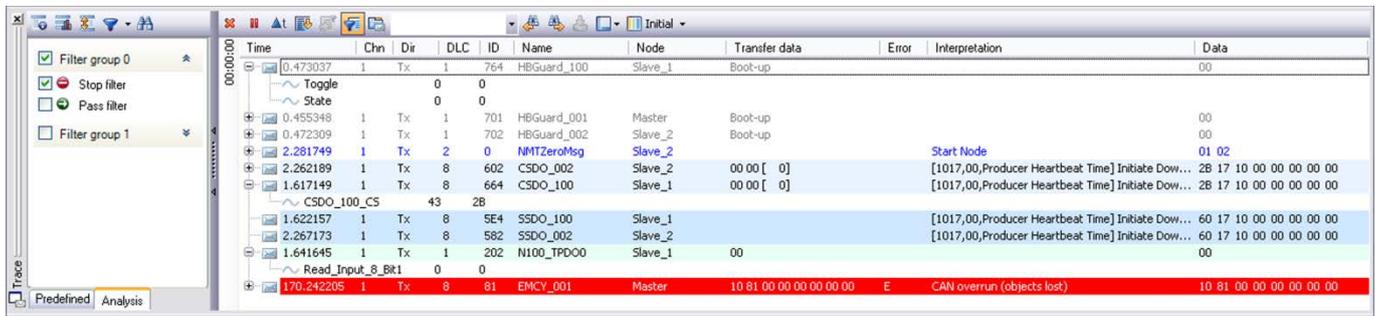

Figure 4: Color highlighting of CANopen services in the Trace window accelerates bus analysis.

7   Interactive Generator Block CANopen

CANopen-specific message sequences can be assembled within a dialog. From a project-specific list of existing messages, you select and configure the desired messages (PDOs, SDOs, etc.) and assemble them into a sequence. The sequence can be replayed once or periodically. This means that message sequences can be sent to the connected devices as often as desired.

8   Training

As part of our training program, we offer a range of classes and workshops on CANopen in our classrooms and on-site at our customers. For more information and the dates of our training courses, please visit our website **www.vector-academy.com**.

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